Smithsonian

March 1983

Sled-dog 'musher' hugging a husky, flexible flier of the North (p. 88)

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March 1983

Smithsonian

Volume 13, Number 12

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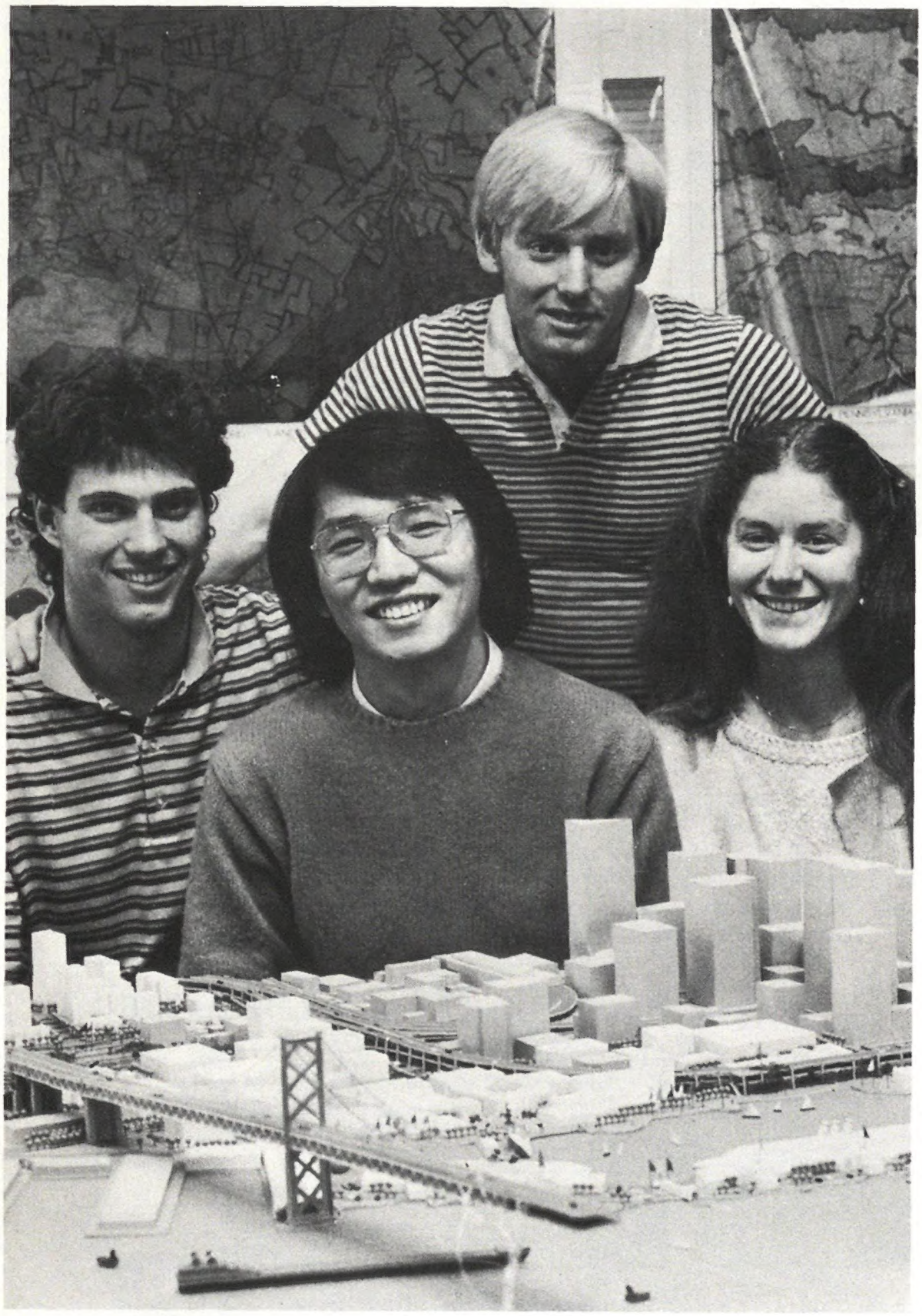

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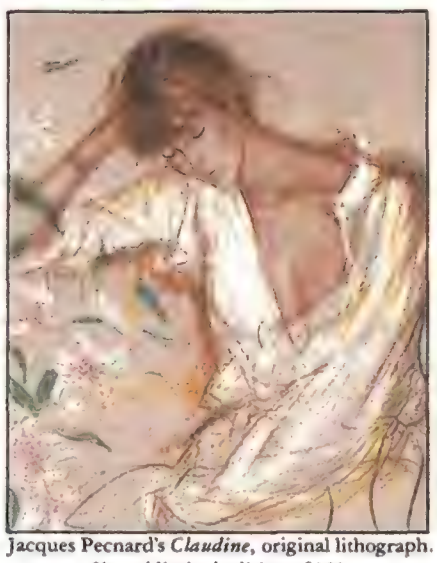

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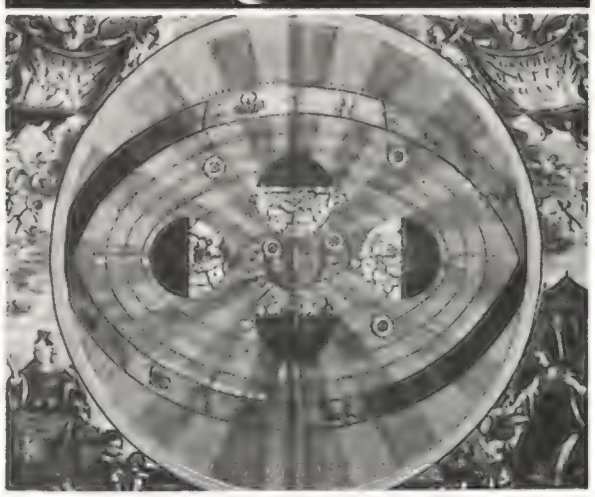

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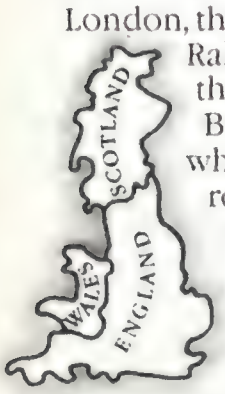

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Secretary Ripley's comments

The view from the castle

Half the Smithsonian's work would never get done if, from the beginning, it had not depended on the services of volunteers

In all good faith, the Reagan administration has rekindled the use of a word which is inherent in the American ethos: voluntarism. It is as American as apple pie, believe it or not, for it is in the tradition of our nation. Volunteers, whether in peaceful pursuits and interests or in war, have played a continuing role throughout our history.

It is sensible and wise to remind ourselves, in hard times as well as good, that many aspects of life could not be accomplished without that spirit, that desire, to work for love, for enthusiasm—work that generates self-satisfaction, a sense of achievement and a gratifying inner certainty.

Without volunteers, as Philip Kopper records in his new book, *Volunteer! O Volunteer!* (published by the Smithsonian Institution Press with the support of the Women's Committee of the Smithsonian Associates), this Institution couldn't exist. The degree to which volunteer efforts sustain every facet of the work of the Smithsonian, and have since its earliest days, is perhaps not often appreciated, but we who live and work here are gratefully aware of it, especially in these darker times of limited budgets and frozen paid-personnel registers. In the past fiscal year, 1982, the Institution enjoyed the services of 4,786 volunteers, considerably more than our paid staff. They gave more than 500,000 hours of work to the Institution, representing more than six million dollars' worth of time spent, figured at a modest rate.

Volunteers, according to this little book, man a ham radio station for us, study the history of American nutrition, translate scientific German, answer questions from "Where's the Star-Spangled Banner?" (or the rest room) to "How do you get a boa constrictor out of a washing machine?"

As Kopper relates, "Without volunteers, the National Portrait Gallery would have opened its doors [in 1968] with no Education Department, an office crucial to [its] function. . . .

"Without volunteers, the Insect Zoo would still only be someone's promising idea. Instead, it is one of the Natural History Museum's most popular attractions (after that [Hope] diamond), a place where children and their older charges lose their fear of caterpillars, watch how bees make honey, and see the tarantulas get fed—by volunteers, of course.

"Without volunteers, the Mall would look the same from one end of the year to the next and not become an al fresco Mecca for millions during the summer's annual Festival of American Folklife."

And indeed it has always been so. From the time of Joseph Henry, the first Secretary in the 1840s, and his corps of informants charting weather statistics to lay the foundation of the Weather Bureau, to Spencer Baird and his volunteers on geographical and boundary surveys in the 1870s and '80s, the popularity of the program never faltered. From the documenting of the tribes and customs of Native Americans to our present-day indoctrination for workers abroad in the Peace Corps, this marvelous *giving* and *getting* process—the benefits of working for the Smithsonian and receiving knowledge in return—goes far to enhance the image of America as a place of rewarding work and productivity.

S. Dillon Ripley

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Letters to the Editor

Polish posters

Dear Sir: Susan Hornik caught the real flavor and taste of this form of Polish art and its special significance in Polish life, where censorship by the ruling authorities forces from artists the most subtle means of conveying the truth. She might also have mentioned that the Polish reader possesses as well an uncanny sense and ability for reading between the lines perusing the official publications for what is *not* printed, unraveling the doublethink and newspeak that characterizes them. In this, as in reading the messages of poster art, the Poles have no equal; their history has given them unparalleled experience in developing this skill.

One of the chief propagators of Polish poster art is right here in the Washington area—the Old Warsaw Galleries in Alexandria, Virginia, where clients have been treated to exhibitions of poster art by Polish masters over the years.

Edwin P. Kulawiec
Washington, D.C.

Dear Sir: Tad Trepkowski's powerful image of the falling bomb, with only the word "NIE!" actually has two meanings. While it stands for "NO!" in Polish, it means "NEVER!" in German. Since it was shown at the Peace Congress in Vienna in 1952, the German version could actually be the original meaning.

Hans Pollak, M.D.
Gloversville, New York

Dear Sir: As a longshoreman and an artist, I must admit that Susan Hornik's wonderful article stirred up a consider-

If choosing between life insurance and competitive interest rates has you tied up in knots...

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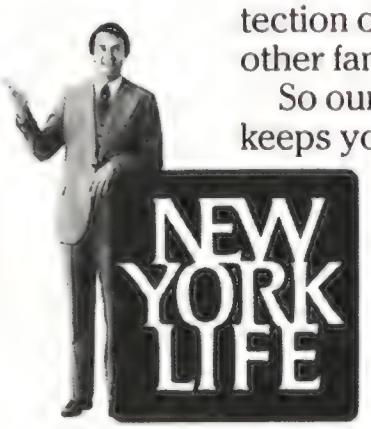

"ASK ME."

*Not available in all states. Issued by New York Life Insurance and Annuity Corporation, a Delaware subsidiary of New York Life Insurance Company, 372 Park Avenue South, New York, New York 10010.

able envy in me. So much attention to Polish labor and Polish artists. I wish we had the same.
Robert Bruce Melcher
Larkspur, California

Buffalo Bill

Dear Sir: I shed a few tears at the *Boston Record* cartoon of January 15, 1917, showing a youngster weeping over the death of Buffalo Bill, and the loss of a hero—the one, the only, the incomparable Buffalo Bill—whom he had revered all his life. With toy guns he and his playmates had enacted their version of the winning of the West countless times, and now the living connection between that era and his present was forever broken.

I know, for had Mr. Cody's death occurred 75 years ago instead of 66, that lad of 12 years could well have been I.
Carroll R. Davis
Salinas, California

Dear Sir: As a child of seven I, along with my two young brothers, was taken to a big circus at Chicago's Soldier Field—I believe it was Barnum & Bailey. For 50 cents extra we could see "The Wild West" and, naturally, we begged our parents to let us stay for it.

Your article brought back to me the image I saw as a little girl. Oh, how thrilling when, out into the stadium, rode that spectacular figure astride a magnificent white horse! With his silver-white hair and his flowing white beard, he was beautiful, leading the way for the rough-and-ready cowboys and the Indians in their gorgeous feathers—all riding like the wind.

Thank you for a memory reawakened, Mr. Doherty.
Helen I. Venn
Sacramento

Dear Sir: "The last of the great scouts" may have braved the waters of the Grand Canal with Native Americans, but the photo in a Venetian canoe was taken on the Bacina e Canale di San Marco: witness the campanile and Doge's Palace in the background.
Frederic C. Jensen
Portland, Oregon
Mr. Jensen is correct. Ed.

Dear Sir: Mr. Doherty says that the wagons used in Buffalo Bill's "Wild West" to

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simulate pioneers crossing the plains were "genuine Conestogas." They may have been, but the wagons used for the trek West were called covered wagons or prairie schooners.
N. H. Schearer
Havertown, Pennsylvania
The Conestoga, the first heavy-duty overland freight wagon, originated in the 18th century and was used widely in the Conestoga region of Pennsylvania in the East and eventually across the Alleghenies. Its design included a floor curving up at the ends to prevent the contents from shifting about on grades. A 19th-century adaptation, the prairie schooner, flat-bottomed and with lower sides, was indeed the favored mode of transportation for settlers moving West. According to Paul Fees, curator of the Buffalo Bill Museum in Cody, Wyoming, prairie schooners were referred to often, albeit incorrectly, as Conestogas. Ed.

Manú National Park

Dear Sir: The butterfly perched on the side-necked turtle on page 41 is feeding, as can be seen by its uncoiled proboscis that extends into the turtle's eye. It is a nymphalid and, I suspect, a male, seeking salts accumulating in the surface of the reptile's eye fluids. In some groups of butterflies, males obtain from this and other sources, such as mud puddles, salts that enter the metabolism of pheromone compounds used in courtship.
Allen M. Young
Curator, Invertebrate Zoology
Milwaukee Public Museum

Dear Sir: Your article on the Manú preserve in Peru was timely, because it may not survive much longer. Given enough publicity, parts of the Amazon basin, such as Manú, may save themselves by becoming carefully controlled tourist attractions that could be vital to the region's economy.

Incidentally, the picture on pages 38-39 contains scarlet macaws [the birds with yellow on the wings, above right] as well as red-and-green macaws. If the names do not do justice to these beautiful birds, it is because naturalists, faced with finding names for several thousand species south of the border, have simply run out of words to describe them.
John W. McCoy
Indianapolis

Red-and-green-macaws share a riverbank with scarlet macaws, Manú National Park.

Ban Chiang

Dear Sir: I find your article exciting in that it casts doubt on where and when civilization began. Fun to find that out. If we knew what wiped out those people, we might have a better chance of helping "Homo sap," the most endangered of all species, before it is too late.
Richard B. Snow
West Redding, Connecticut

Columbia Glacier

Dear Sir: Great photos of the blue-white cliffs of ice . . . but as with many of nature's beauties, it can threaten life if it is not respected.
Bruce Norman
Berlin, Connecticut

Phenomena

Dear Sir: There is another possibility regarding extraterrestrial life forms not cited by Mr. Wiley. They may well exist and be here now, quietly incorporated into our cultures as observers or global monitors—a logical step in ascertaining the maturity of a planetary society prior to actual formal contact and relations.

Before we ask if there is intelligent life in space we should be introspective about our behavior as a species and ask if there is intelligent life on Earth.
Lee Ratzan
Princeton, New Jersey

Dear Sir: John P. Wiley jr. suggests we suppose that, in the random order of

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things, life arose first on Earth because Earth was created specifically for the purpose of producing Man.

Maybe we keep looking through the wrong end of the telescope. We are astounded by the universe but blasé about the miracle of Man and the mind of Man.
May Allers
Pittsburgh

Hulla blue and persimmon

Dear Sir: Your article is so true. Years ago a friend, in redecorating, selected a fabric that she described as "pea green." "Oh *no*!" said her horrified decorator. "We call that 'Baby's First Summer'!"
Mary Fieldman
Highland Park, Illinois

Dear Sir: A sense of fairness requires that the record be set straight on colorful terms attributed wrongly, in Stephanie Mansfield's lighthearted essay, to the Ford Motor Company.

The real credit belongs to Eagle Shirtmakers. Eagle conducted a contest in 1964 soliciting entries for new names for the colors in which they marketed their products. There were 177 winning suggestions. Then Eagle subsided until its (ahem!) Eagle eye fell, some five years later, on the appropriation, by Ford, of its lawfully protected property in the naming of colors in its new line of cars.

Instead of a lawsuit, Eagle chose to sponsor another contest, on behalf of Ford, offering prizes of new shirts to those submitting new names for Ford colors. Talk about turning the other cheek! Unhappily, I never saw, or at least did not preserve, any announcement of the winners. But in my own simple way I have derived endless pleasure from mulling that original Eagle color list.
Kearney L. Jones
Delmar, New York

In a spirit of sharing the wealth, SMITHSONIAN *and Mr. Jones offer our readers the following samples from Eagle's list: Forever Amber, Chat Aqua, Gar Beige, Noblesso Beige, Civil War Buff, And-to-Hell-with-Burgundy, Bizet's Carmine, Roe Cocoa, Eagle's Cream, Profits Ecru, Goodclean Fawn, Unforeseeable Fuchsia, Hard-Hearted Henna, Strip Ochre, Political Plum, Mason-Dixon Lime, Cost-of-living Rose, Livery Sable, Hell Sapphire, Bipartisan Slate, Outright Steel, Charla Tan, Down Umber.* Ed.

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1918
Air Mail Issue

22kt Gold Replica

24¢ Inverted Jenny

Enlarged Reproduction
of the Original Stamp

First Day of Issue
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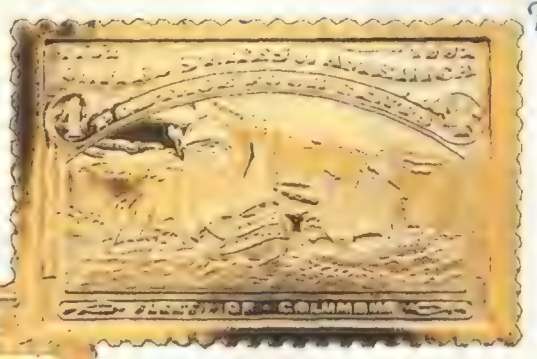

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Your collection will contain replicas of all the great pictorial issues that made American stamps internationally famous. The Post Rider & Horse and Locomotive stamps, issued in 1869, the year our Atlantic and Pacific coasts were first linked by rail. (Until that moment, the world had never seen a pictorial stamp, only portraits.) And with this breakthrough, made possible by advances in engraving, U.S. stamps began to portray the proud history of America's rise to prominence and power among nations.

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This series was followed by the historic nine-stamp Trans-Mississippi Issue — the story of the winning of the West. And then the five-stamp Panama Exposition Issue...the three-stamp Pilgrim Tercentenary Issue...and many more.

Of course, no collection of U.S. classics would be complete without our magnificent early air mail stamps. The three spectacular Graf Zeppelin stamps, for instance...and the greatest rarity in U.S. philatelic history, the renowned "Jenny Invert," issued in 1918, the year U.S. Air Mail Service was officially inaugurated. (For the fascinating stories of some of these classic stamps, be sure to read the descriptions accompanying the photographs.)

Each and every stamp re-created in this collection is a philatelic treasure. You'll be astonished by the details, the designs, the sheer dramatic impact. You'll admire the scrollwork, the lettering, the embellishments and rich ornamentation. Truly, these early American stamps have never been surpassed.

(continued on next page)

24¢ Inverted Jenny Air Mail Stamp of 1918

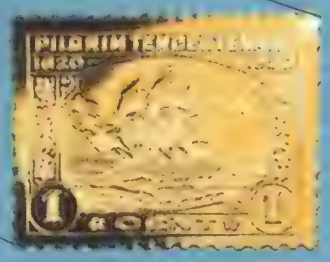
One of the Most Famous and Valuable Stamps in the World

Imagine the astonishment of William T. Robey . . . when he walked up to a Washington, D.C. post office window on May 14, 1918, and bought a sheet of 100 24¢ air mail stamps — only to find the image printed upside down! Today a single specimen of this rarest and most valuable U.S. stamp of all can command up to $150,000 at auction. The stamp depicts the famous Curtiss flying "Jenny." It was issued when the U.S. inaugurated the first regularly-scheduled air mail service. As such, it is an historic stamp — even when printed right side up!

1920
Pilgrim Tercentenary Issue

22kt Gold Replica
1¢ Mayflower

Enlarged Reproduction of the Original Stamp



Look closely at this famous stamp — part of the three-stamp Pilgrim Tercentenary Issue of 1920 — depicting the "Mayflower." This issue is one-of-a-kind in that the name of the United States does not appear. Was it an oversight? The Post Office said no — in response to rumors that the stamps might be recalled. Still, this omission has never occurred again — making these stamps especially desirable to collectors.

1847
Regular Issue

22kt Gold Replica
5¢ Benjamin Franklin

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(continued from previous page)

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4¢ Fleet of Columbus

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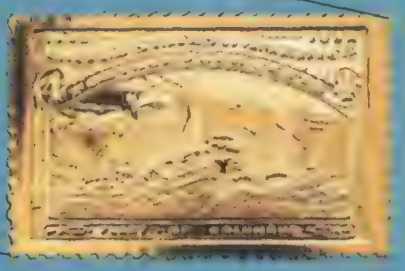

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Around the Mall and beyond

Elsewhere in this issue is an article about spectacles. In a demonstration of our editorial foresight (or luck), it appears on the bicentennial of an event in which spectacles played a leading role. They were George Washington's spectacles. A pair of them—although not necessarily the ones I am going to tell about—is in the Washington exhibit at the Museum of American History (see this column for February 1982). They had a lot to do with shaping the course that our young nation took, 200 years ago this month.

Picture the scene: March 1783. Lord Cornwallis surrendered 17 months ago, and the British troops that remain in America are inactive. The largest garrison is in New York City where the British commander, Sir Guy Carleton, has his headquarters. The American Continental Army is still in winter quarters up the Hudson, keeping an eye on the redcoats and an ear cocked for orders from Newburgh, where General Washington is stationed. Both sides want peace and it is on the way, but everyone is waiting for the exact terms to come from Paris.

Washington, like everyone else in the army, desperately wants to go home, but he is badgered by a number of problems. Tory and patriot civilians have been murdering each other; Vermont, which has been governing itself as a sort of republic for the past six years, wants to become a state, but New York, New Hampshire and Massachusetts are bickering over its boundaries. That's not something for a general to settle—not in a republic—but it's dumped on Washington anyway, because as always he's the only man in America willing and able to take it on.

His worst problems involve the Continental Congress. It sits in Philadelphia, some of its best members—Benjamin Franklin, John Adams, John Jay—away in Europe, having tied up most of the peace settlement. Congress is broke, divided and weak. At home it lacks the authority of any single one of the 13 sovereign states. It can't collect taxes or customs duties. Its main clout is the army, and it still can't pay the troops—or even supply them. Only the towering presence of George Washington holds the sullen soldiers, the quarreling states and the impotent Congress to the old cause of liberty and union.

The implications of commanding the one source of power in America give General Washington no joy. Less than a year ago, one of his colonels wrote to him suggesting that he become king—George I of America—and with the army behind him start running a proper government with the power to tax. Adamantly, the squire of Mount Vernon wrote back, "You could not have found a person to whom your schemes are more disagreeable."

With a little help from his glasses, Washington squelched an army plot.

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Again, his military leadership is being confused with government leadership. Only last month his former aide Alexander Hamilton, now in Congress as a Representative from New York, wrote him that if the army didn't get proper provisions and back pay, the soldiers would not disband, but would go live on the land and stick together even after peace came. Only in that way, wrote Hamilton, will the army "procure justice to itself." Hamilton wants Washington to lend his support to the troops in this extremity. He himself foresees and desires a strong central government and he wants Washington on his side. He tells the general his leadership of this show of force will have the effect of keeping things within the bounds of moderation.

Washington is now writing back: He didn't realize Congress was right at the end of its financial rope. He had the notion that "with the prospect of a loan from Holland, we should be able to rub along." As for leading an army movement, no thanks. He'd rather the army just keep on petitioning the Congress to do the right thing by the Continentals.

Washington, who has seen his soldiers suffer through one ordeal after another, including Valley Forge, is painfully conscious of the real and justified discontent among officers and enlisted men. But he's taken by surprise when, on the tenth of this month, two unsigned papers are passed among the officers at Newburgh. One calls for a mass meeting next day. In the other, the anonymous author appeals to his colleagues, saying that like the rest of them, he has "felt the cold hand of poverty without a murmur, and has seen the insolence of wealth without a sigh. . . . But faith has its limits. . . ." He asks if they see "a country courting your return to private life with tears of gratitude. . . . Or is it rather a country that tramples upon your rights, disdains your cries, and insults your distresses?" He asks the officers if they're willing to spend the rest of their lives as charity cases. "If you can —GO—and carry with you the jest of Tories and scorn of Whigs. . . . Go starve and be forgotten."

The army should forget moderation and forbearance, this unnamed but elegant writer argues. The implication is clear that the army warn Congress and the states represented in it that the new country needs a real government, one

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that can levy taxes, encourage commerce, pay troops. If the army's grievances are not met, he insists, the troops must remain mobilized and armed. And should another war arise, they must "retire to some unsettled country" and mock the Congress when it asks for help.

Washington finds himself disturbed by such words. With his men he has shared toil and dangers. With them he has despaired at the official indifference that they have received in return. Yet he recognizes in this letter the possibility of military dictatorship. The scheme isn't just a threat by mutinous enlisted men, but a most compelling argument by officers with a background of leadership. They are probably capable of trying it. And if, as Hamilton has suggested, George Washington steps into the lead for the sake of moderation, he is likely to be swept further along with the movement. Will he take up the role of Oliver Cromwell?

His thoughts are private for a moment. He knows the country faces a fork in the road. In view of the division between various regions of the country, their distrust of granting authority to *any* congress, a return to the strong, stable government not unlike the one the Crown imposed might have held a certain temptation. And this time there would be no far-off British king to rule. The alternative often seems a vague and distant goal —a chance at a new kind of government that promises unheard-of liberties, but might bring civil war. Or something that, as a good 18th-century gentleman, Washington fears: tyranny of the majority.

The general ponders the alternatives—including, of course, the possible future that has opened up for himself. He has always had strong ambitions. But he must have thought of the almost certain bloodshed involved in trying to force the states to fall in line with the army's wishes, and of all that he had struggled and sacrificed for, all that so many of his men had died for. And he decides to continue on the path he has traveled thus far.

He sends off an order condemning the unauthorized mass meeting of officers, but calling for one of his own on the 15th of this month. Some officers are delighted by what seems an indication that the general himself may be about to accept their plan, though perhaps on his own terms. No one could possibly stand before them if the great Washington leads. All opposi-

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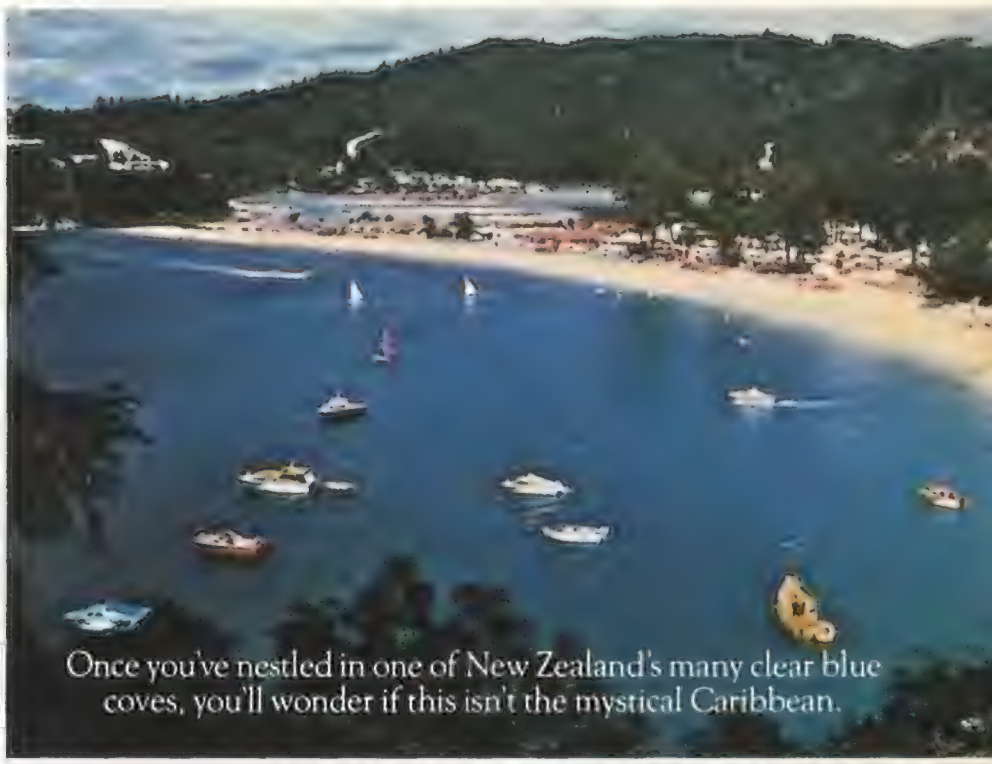

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tion will wilt before that well-known, awesome presence.

On the 15th, Washington enters the "Temple of Virtue," a meeting hall built by the soldiers for church services and recreation. It is a big room—big enough to hold 600 troops. This time it is jammed with the officers of the Continental Army. They don't seem as eager to see the commander as they usually have been. They stare at him stonily as he begins to speak.

He reminds them that he is one of them, that he has suffered at their distresses and rejoiced at their triumphs. He sympathizes with their problems. But then he rips the proposal apart: "My God! what can this writer have in view by recommending such measures? . . . Can he be a friend to this country?" He hammers at the ideal of separated military and civil powers, he warns of the loss of liberties, of the undoing of all they have fought for. He suggests that Congress will do the best it can. He urges patience.

It doesn't seem to have much effect on those war-toughened faces. The general digs in a pocket to produce a letter from a member of Congress. This, he says, will indicate what they're trying to do down there in Philadelphia, and how hard it is to do it. He starts to read. He stumbles over a word or two, and then stops. The officers suddenly hold their breaths: What can be wrong with their old commander?

Then Washington goes for another pocket and pulls out a pair of spectacles. He had them made recently in Philadelphia, and few people have seen them before. Now he puts them on, explaining quietly, "Gentlemen, you must pardon me. I have grown gray in your service and now find myself growing blind."

He reads the letter, but he doesn't have to. For years, these officers have known their general and honored him as a sort of father figure, an iron man who never gave in to weakness, who held their impossible enterprise together against all odds, and finally won. Now, seeing him suddenly aged and mortal, they cannot keep the tears from welling; they cannot break old bonds of loyalty and affection.

General Washington walks out, tucking his spectacles back in a waistcoat pocket. This moment of theatricality has turned the trick. His officers quickly repudiate the plan and express renewed faith in shaky Congress.

Nothing remains but the waiting for peace, for the arrival of news that France and Spain have signed the preliminary peace treaty with Great Britain. It comes at last—a messenger gallops into the Newburgh headquarters on the 26th of March carrying the word. The final signing by all the powers involved may take some months. But peace is here after the years of bloody fighting.

By now the last snow is melting in the forests. Willow wands are greening, crocuses send fresh shoots through the old blackened leaves, and snowdrops blossom. In the headquarters garden, thyme and sage are freshening. In streams the shad are beginning their run, and in trees and shrubs the early songbirds pause on their migration—robins, of course, and the welcome bluebird. Someone has seen a hermit thrush, and someone has heard a few notes from a vesper sparrow just before the evening concert of the peepers in the newly thawed marshes. For all the new country, spring has finally come.

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Phenomena, comment and notes

Much science fiction is possible, even reasonable; but the human race can go further than we can now imagine

Predicting the future is something of a minor industry, practiced in supermarket tabloids and scholarly books. Successes are trumpeted, but the whole business is very much like baseball: if you succeed three out of ten times, you are a star. Nobody bats 1.000, or even .500.

Much forecasting is for a year at a time; more ambitious efforts encompass 20 years, sometimes even 50. These are numbers within the scope of a human lifetime, a natural limit to our attention span. Most forecasts simply extrapolate from where we are now, and rightly so: the forces at work now have a momentum that will carry on for decades. If a cheap, long-range electric car were invented tomorrow, it would be many years before it replaced the cars now on the road. If every government decided that cutting down the forests was not such a good idea after all, it would be years and years before the world adjusted to tree farms and alternate materials.

The human imagination, however, easily soars over the trifling span of a human life. It can build on our current understandings of ourselves and the physical universe and consider what things will be like in a thousand or a million years. What will science be capable of, then, and what will be the impact on human beings? In fact, what will humans be like in the far future?

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17	DC-10	Daily	1:20 p.m.	6:15 p.m.*
From Hong Kong:[2]				
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Flight	Equip.	Day	Leave	Arrive
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148	747	Tues.	7:00 p.m.	11:55 a.m.**

[1] Schedule eff. 4/24/83 to 10/30/83. Ask your Travel Agent or United about schedule prior to April 24.
[2] Schedule eff. Spring 1983.
*Arrive next day. **Arrive same day.

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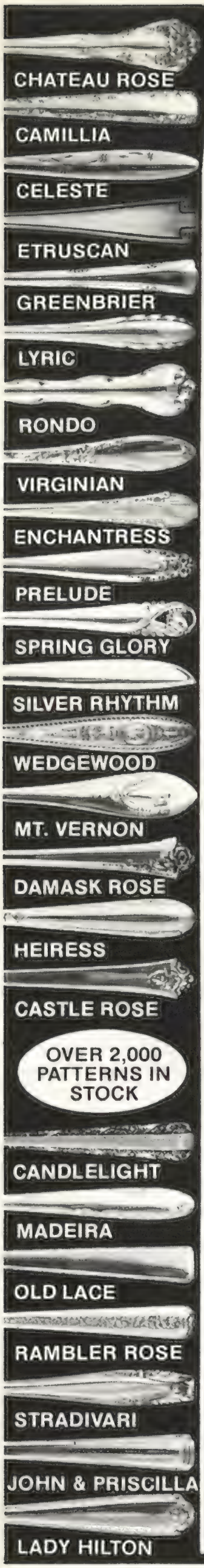

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vance, and devise ingenious technologies to make it all happen. When events overtake their imaginations, as with atomic bombs and voyages to the moon, they pull up and move farther into the future. It would seem a safe place, where no one can prove them wrong. But there is no reason to expect that in the future, even the far future, everything we know now will be inoperative. We certainly expect to know a lot more, to understand a lot better, but what we find out in the future is likely to extend, not contradict, what we know now.

For decades I've read magazines with names like *Astounding* (now *Analog*) and *Galaxy* (now unhappily defunct). Time machines and space warps (distortions of space that make it possible to get from here to there faster than light itself could in regular old everyday space) seem as familiar to me as television receivers and travel by jet aircraft. But just because they are familiar does not mean they are possible, no matter how many centuries we will have to figure them out.

So it is fair to take a hard look at the science in science fiction. Three British authors have done just that in an extraordinarily lucid book that explains what I call "cocktail-party science"—the fascinating extremes—and introduces the best of science fiction. Called simply *The Science in Science Fiction*, just published by Knopf, it is the work of Peter Nicholls, who produced *The Encyclopedia of Science Fiction*; David Langford, who trained as a physicist at Oxford; and Brian Stableford, who studied biology at the University of York.

The book covers it all: space travel, time travel, aliens, weapons, intelligent machines, future human evolution, telepathy and telekinesis, UFOs and ancient astronauts. The authors open right up with an explanation of the distances involved in interstellar travel, and review the best current designs for starships and strategies for the crews to man them: put them to sleep for thousands of years, or design the ships for many generations. They ask the converse, where are the "space arks" of other civilizations, and conclude that the Galaxy does not seem to have been colonized and is therefore open to us.

The three writers (each wrote certain chapters, but I'm inclined to give them all credit for the whole book) have a way of turning the most ambitious ideas around and applying them to the Earth. They talk about "terraforming," for example, the science of making other planets more Earth-like than they are now. Apparently it could be done. We could seed the atmosphere of Venus with blue-green algae that would consume the carbon dioxide and release oxygen. This would stop the runaway greenhouse effect, cooling down that now hellish world in only a few hundred years to habitable temperatures. We could warm up Mars by sprinkling it with dark dust and melting its carbon dioxide "ice caps" with giant orbital mirrors.

The authors' conclusions, however, have nothing to do with Venus or Mars: "Like charity, perhaps terraforming should begin at home. If we can succeed in restoring a life-sustaining environment on our own crowded planet, it may be comparatively simple to create such environments on other, emptier worlds."

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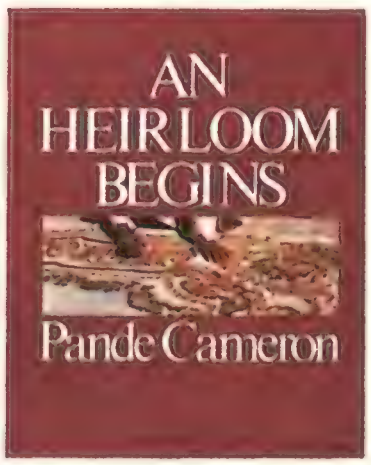

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They do the same in a chapter on energy. "Science fiction's images of a low-technology future may be romantic," they say, "but they are also realistic." They then run through the promise and problems of nuclear fission, fusion, waste heat and solar energy.

In the more distant future we would tap all the energy in the Solar System, perhaps by building a Dyson sphere around the sun. A civilization still further advanced might use the resources of a galaxy, "chewing up stars as casually as we throw another log of wood on to the fire; it would be using gamma ray lasers to cause stars to go nova [blow off their outer shells] if the fire died down . . . and if its civilization really started feeling the energy pinch, it would manipulate black holes to collide. . . ." Energy will make us or break us, the authors say, and we do not yet know which will happen.

As to time travel, they point out that it leads to the same kind of paradoxes as does faster-than-light travel (SMITHSONIAN, November 1976). What would happen if you went back in time and killed your grandparents? Space warps, on the other hand, may not be quite so verboten. It just might be possible to navigate your starship through a black hole and emerge into another universe. (You won't be able to come back, however.)

The book gives short shrift to parapsychological phenomena and the tabloid world of UFOs. In a final chapter on famous bad predictions, the authors end with the disappointing thought that the whole idea that we are inexorably on our way to the stars may be wrong. "Now, though space-technology spinoffs have changed the world and satellites are big business, it seems that the larger dream of space might itself have been a bad prediction. Economics is closing it down. The Space Age may already be over."

The Space Age may indeed be over, at least for the time being. The human race has more important fish to fry these days. But we have a lot of time, more time than the human mind can grasp. Writers trying to put history into context sometimes translate the Earth's 4.5-billion-year age into one year. Then the whole 10,000 years of civilization becomes the last minute and few seconds before midnight; the technological revolution of the past 200 years becomes the last 1.4 seconds.

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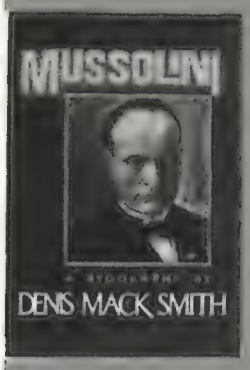

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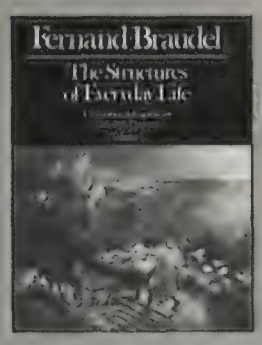

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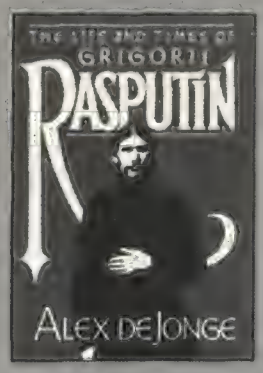

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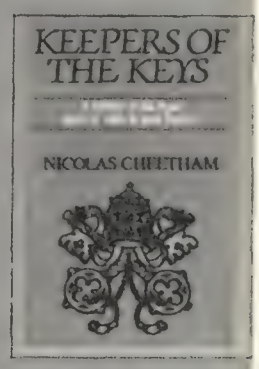

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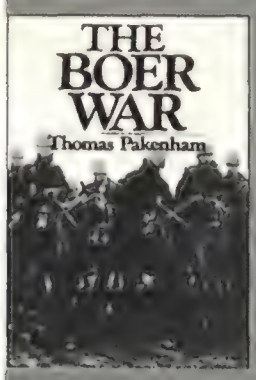

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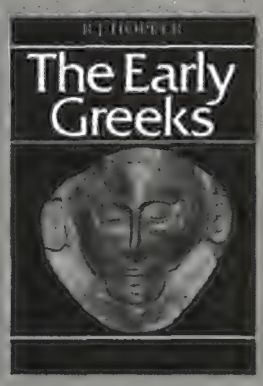

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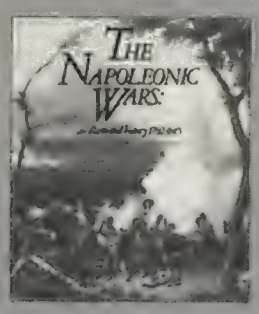

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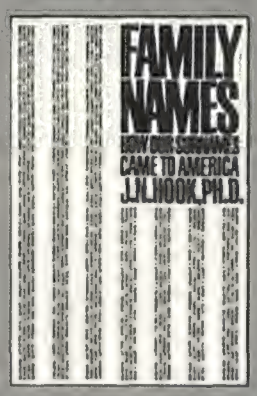

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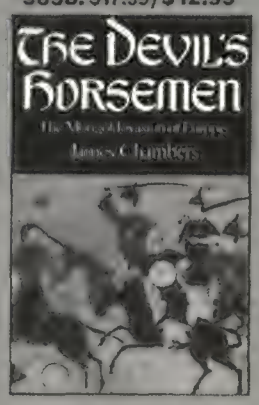

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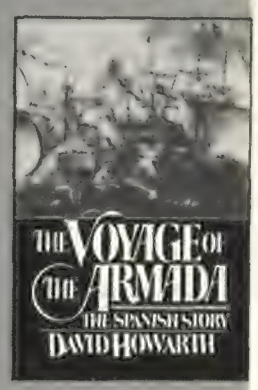

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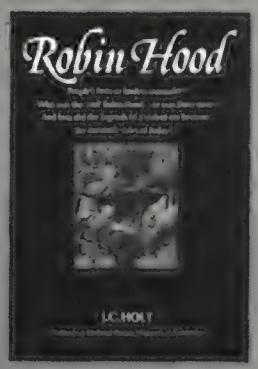

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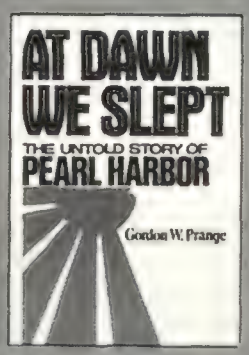

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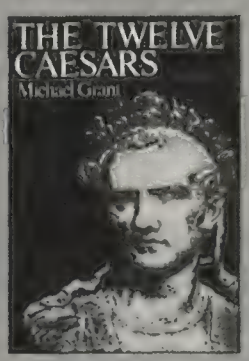

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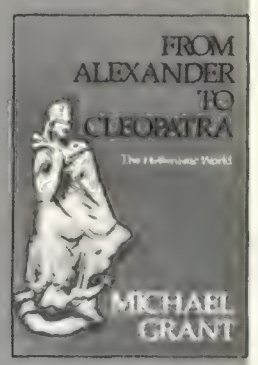

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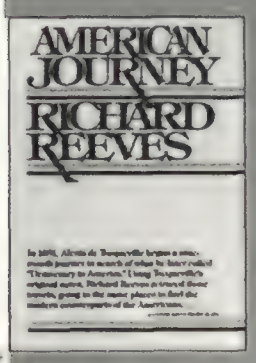

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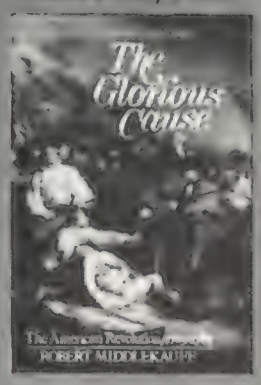

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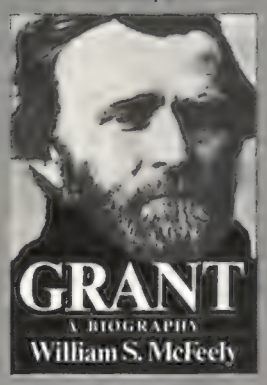

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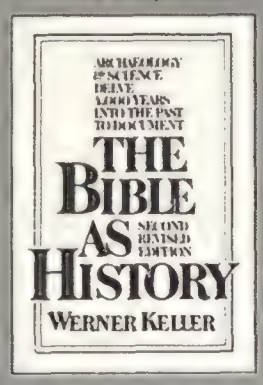

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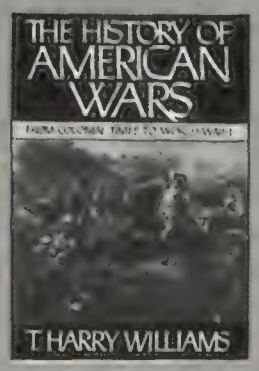

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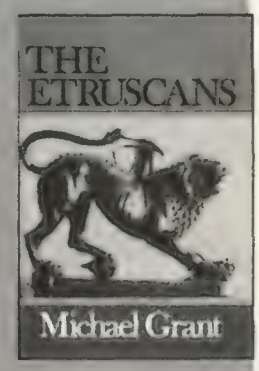

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tronomers tell us the sun is good for at least another 4.5 billion years. In that respect, at least, the planet will be habitable. Then we can think of all recorded history as only the *first* minute of a whole year. If all the wonders of our technology have been developed in just one second of this symbolic year, consider that a year has no fewer than 31,536,000 seconds.

On such a time scale, prediction is silly. We are stuck in our time, as Loren Eiseley suggested, like a plant rooted in space. And yet, he continued in *The Immense Journey*, "Considering the innumerable devices by which the mindless root has evaded the limitations of its own stability . . . it may well be that man himself is slowly achieving powers over a new dimension—a dimension capable of presenting him with a wisdom he has barely begun to discern.

"Through how many dimensions and how many media will life have to pass? Down how many roads among the stars must man propel himself in search of the final secret? The journey is difficult, immense, at times impossible, yet that will not deter some of us from attempting it."

It is fun to think that many of the predictions in science fiction may well come true. When Nicholls et al. offer a "tour of the more bizarre mental landscapes opened up by scientists and philosophers, and colonized zestfully by a lunatic army of writers, always ready to do battle with the unimaginable," I'm ready to go.

Beyond science fiction, it makes me deliciously giddy to realize that anything we can think of now is only the barest beginning of a world of wonders we cannot imagine. The best way to get there, the only way to get there, is to learn how to live intelligently enough in our own time so that Eiseley's immense journey can continue.

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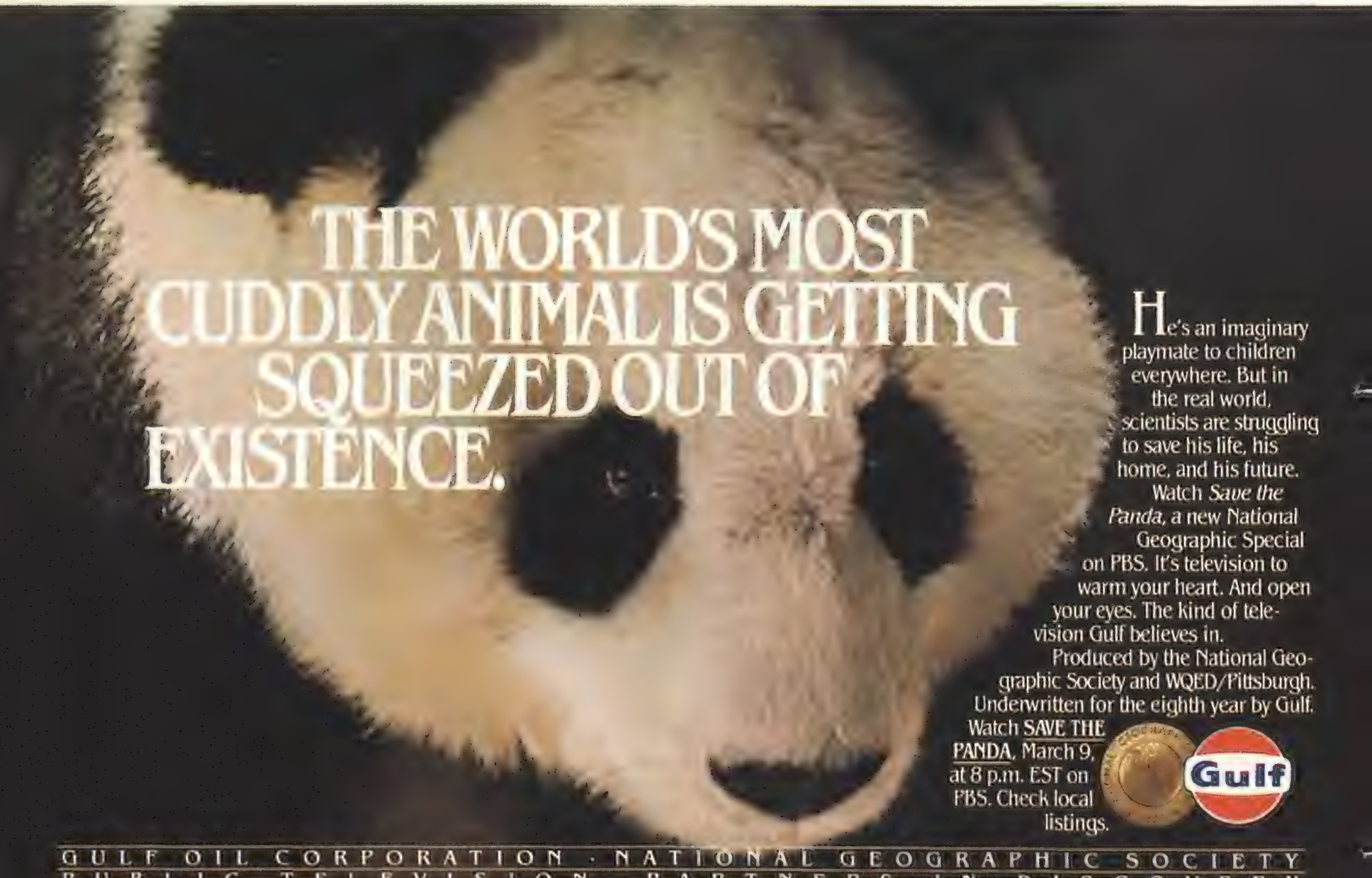
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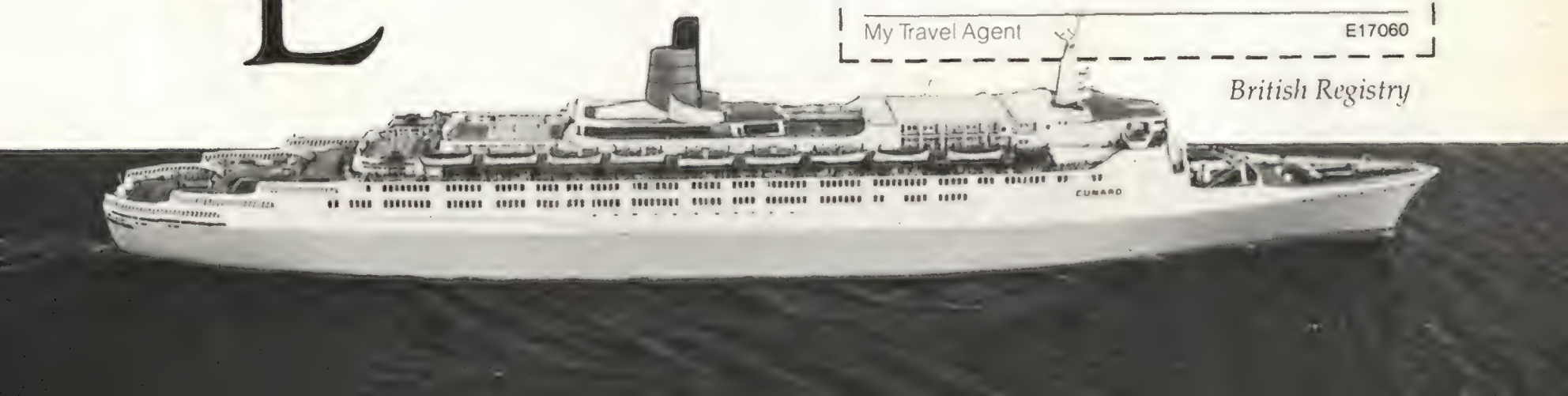

Points of origin

National Gallery, London

Tax gatherers were acidly portrayed by Flemish artist Marinus (c. 1540); money theme was a favorite and included his bespectacled usurer on page 102.

Across many cultures and centuries, taxes have been a source of distress, but hope for loopholes springs eternal

The tax burden that modern Man groans under is no newcomer to the list of life's complaints. Civil and religious leaders have *always* managed to collect money from the people. A pattern of tributes, tithes, port duties and excise taxes on certain products is common to many cultures. Some of our modern fiscal terms still correspond to those of the Romans, who boasted extensive revenue-collecting systems. The *fiscus*, the imperial treasury, was derived from the Latin word for a moneybag. An *exactor* was a tax collector, and an *assiduus* was a tribute payer.

It was not for nothing that Queen Boadicea of the Iceni, who occupied part of East Anglia in Britain, led a revolt in A.D. 61. Remarks attributed to her are more than vaguely reminiscent of Patrick Henry's more than 17 centuries later: "How much better to have been slain and to have perished than to go about with a tax on our heads! Yet why do I mention death? For even dying is not free of cost with them; nay, you know what fees we deposit even for our dead. Among the rest of mankind death frees even those who are in slavery to others; only in the case of the Romans do the very dead remain alive for their profit. . . ."

Still, it was only a matter of time before Boadicea's descendants put on the cloaks of their Roman tax oppressors. The early English kings bought peace from Viking invaders by instituting a tax known as the Danegeld. Later taxes included a hearth tax, under which every household was required to pay for each of its hearths or chimneys, and a window tax, a way of quickly focusing on the people with big houses—and pocketbooks. The English system was once described thus: "The people are taxed in the morning for the Soap that washes their hands; at nine for the Coffee, the Tea, and the Sugar they use for their breakfast; at noon for the Starch that powders their hair; at dinner for the Salt that savours their meat; in the evening for the Porter that cheers their spirits; all day long for the Light that enters their windows; and at night for the Candles that light them to bed."

Probably the longest-running tax in Western Europe was the tithe extracted by the church. The system of tithing—giving a tenth of one's goods, produce or cash to support one's religion—has ancient roots. At Olympia, the site of the Greek athletic games, the statue of Nike was offered to Zeus by thankful Messenians and Naupaktians who were proffering a tithe of the spoils of war. The Old Testament notes that tithes from the faithful were paid in grain, wine, oil, flocks, herds and the fruit of trees. The New Testament cites criticism regarding the self-satisfaction of the Pharisees in scrupulously paying theirs.

Rules regarding the tithe varied widely from parish to parish and from abbey to abbey throughout Europe. In some places,

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wheat would be cut, bundled and left in the fields for the rector to select every tenth sheaf.

Families sometimes took goods to the church or nearby barns. And it is in this connection that the custom of tithing has given posterity a great esthetic legacy. The building of the great tithe barns that dotted the medieval landscape required complex exercises in architectural design. In fact, some historians regard these great buildings (typical dimensions: 300 feet long, 70 feet wide) as reflecting design concepts found in medieval cathedrals. Many of the largest of them are cruciform in plan and have a nave and two or four side aisles set off by posts that support an expanse of roof. One such English tithe barn, at Great Coxwell, Berkshire, was considered by the 19th-century poet and designer William Morris to be one of the greatest pieces of architecture in England, if not the world.

But perhaps the best commentary on giant barns is available in the words of Thomas Hardy in his novel *Far From the Madding Crowd:* "One could say about this barn, which could hardly be said of either the church or the castle, akin to it in age and style, that the purpose which had dictated its original erection was the same with that to which it was still applied. Unlike and superior to either of those two typical remnants of mediaevalism, the old barn embodies practices which had suffered no mutilation at the hands of time."

It was on these premises—at the tithe barn, or in the churchyard, or on the church porch—that another of the great customs connected with this tax sometimes appears: the tithe ale, a gathering sponsored by the church. John Evelyn records one at a parish near Boston, Lincolnshire, on August 20, 1654. And English poet William Cowper transfixed the social experience of tithing in his "The Yearly Distress, or Tithing Time at Stock, in Essex" (circa 1780), which neatly differentiates parson from plowman:

Oh, why are farmers made so coarse
Or clergy made so fine?
A kick, that scarce would move a horse,
May kill a sound divine.

Ales notwithstanding, the real problem with tithes is that they were so difficult to collect and enforce. Too many parishioners were on an honor system. Then there was the capricious nature of many tithe exemptions, vaguely akin to today's tax

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loopholes. One of the more curious reasons for such an exemption is supplied by a family living in Renwick, Cumberland, whose forebears, it was said, slew a cockatrice centuries ago. The favor was probably a small one considering the danger involved. A cockatrice is a great winged creature that kills with its gaze alone.

With such loopholes, abuses were bound to occur. Perhaps the worst of them was the custom of selling the tithe rights of established parishes and abbeys to laymen. For example, some churches were known to have sold their authority to collect tithes to raise cash to meet short-term needs. These abuses were called "impropriation of tithes" and were apparently common.

Lay impropriators might be responsible for the upkeep of a portion of the church, say, the chancel. But trouble arose when some tried to evade this duty, or felt they actually owned the property itself, and had no compunction about "improving" it. A case reported in 1820 detailed the tribulations of a lay owner who was locked out of the church by the vicar, presumably to prevent him from remodeling the chancel. Nothing daunted, the man simply chopped a hole in the church roof, let himself down, and erected new seats. An assiduous *exactor,* to be sure.
Michael Olmert

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Wouldn't you really rather have a Buick?

By Michael Parfit

Ground water proves a hidden element whose time has come

Once the exclusive domain of the dowsers, water underground is a new resource for scientific measurement and management

Dowser Wayne Thompson wields forked nylon wand, seeking spot to sink a well in a California orchard.

Jay Lehr had been bounding up into the dim and lofty reaches of his dining room off the trampoline in the floor above the ground-water heat pump. Now he sat restlessly on a couch. The sweat on his bronze face gleamed, as if lit by inner fire. His eyes shone.

"I go out of my *mind* over this mystery and occult of ground water," he said. Lehr is executive director of the National Water Well Association. He has been called, with good reason, "Mr. Ground Water." Twenty years ago he spent his days either with his nose pressed against the Plexiglas walls of model aquifers, watching dyed water flow through pores, or sitting alone at the bottom of a swimming pool, wearing a mask and a scuba tank, thinking about what he had seen. All this immersion had added up to the United States' first PhD in the study of underground water.

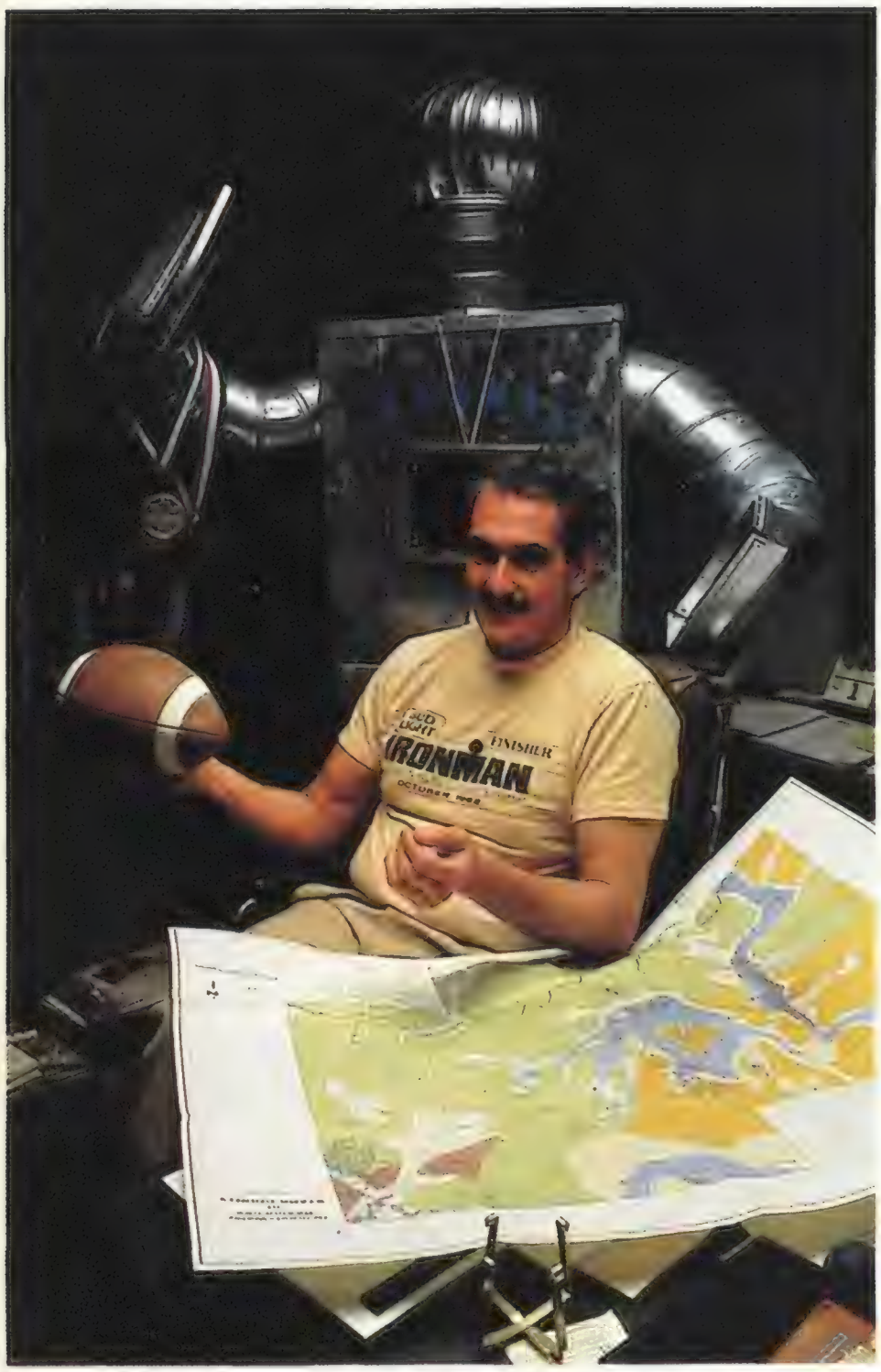
Now he leaned forward, his elbows on his knees, as if about to leap to his feet. "Ground water is just real simple," he said. "It's funny for something so simple to be mysterious."

But it is. I had just been telling Lehr about my own adventures, some unsettling. I had spent some time talking with a farmer in the latter's office near Clovis, California. He was drilling for water through granite; when I asked him how he had decided where to drill he had said, to my surprise, "I had it witched." Later I had walked through the weeds of an orchard north of San Francisco with a dowser named Wayne Thompson.

Thompson was an immensely good-humored man; he laughed and laughed. "There's a vein here," he said, laughing, with his forked nylon wand jumping in his hand. "It intersects another vein over there." On the parking lot of an apple cannery across the street was painted a large red cross. "We'll drill there next week." Noticing my skepticism, he grinned. I told him I would be calling back when the hole was drilled.

Dowsers, who claim to find water with a stick and a sixth sense some think is magnetic and others think is divine, are still honored because, in spite of Lehr's objections, ground water remains a mystery to most of us.

Artesian well near Bishop, California, releases water trapped under pressure; it has spouted for 50 years.



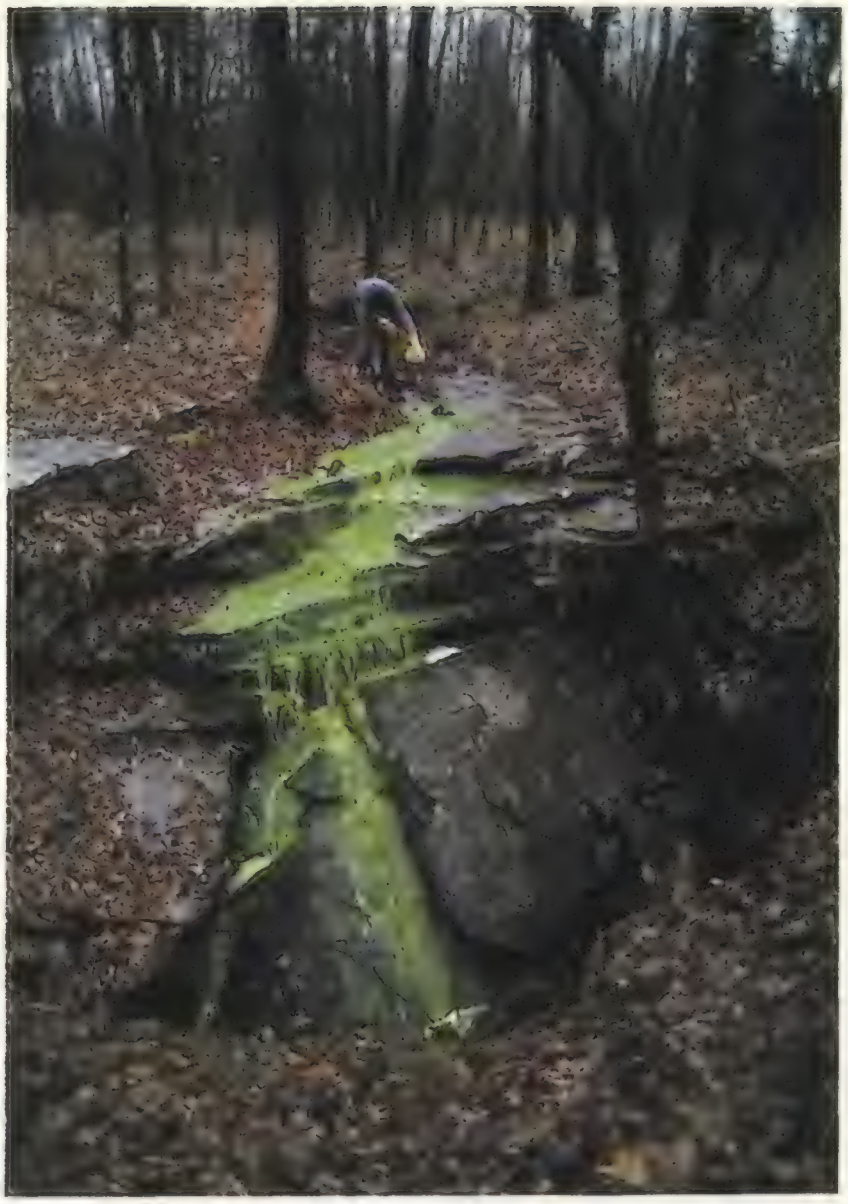
Athletic ground-water expert Jay Lehr "won" metal ductwork statue from staff after World Ironman event.

Hydrologist views underground river near Mammoth Cave; its flow is dispersing pollutants to 46 springs.

The mystery even has legal precedent. The ground-water ownership laws in the eastern part of the United States still derive from an 1861 ruling by a judge named Brinkerhoff who, after conflicting testimony, apparently threw up his hands in despair and wrote the whole thing off. Ground-water movement, he ruled, is "so secret, occult and concealed, that an attempt to administer . . . legal rules . . . would be involved in hopeless uncertainty." Slamming law's door on science, he shut away ground water for a century.

After the dowsers and shortly before meeting Lehr, I had been prowling around in caves. When first you think of ground water, you think of rivers down there. In limestone caves, you get what you expect.

"It's more like a murder mystery," said Dr. Jim Quinlan, hydrologist with the National Park Service, whose choice of words might irritate Lehr. "And I am, shall we say, a detective. I am putting together the clues. I have thousands of them." Quinlan has directed an intensive study of the hydrology of limestone terrains near Mammoth Cave National Park, Kentucky, which are characterized by numerous sinkholes, caves



Dyed stream water acts as tracer, flowing underground through sinkhole and resurfacing in distant springs.

and sinking streams. Such terrains are known as karst.

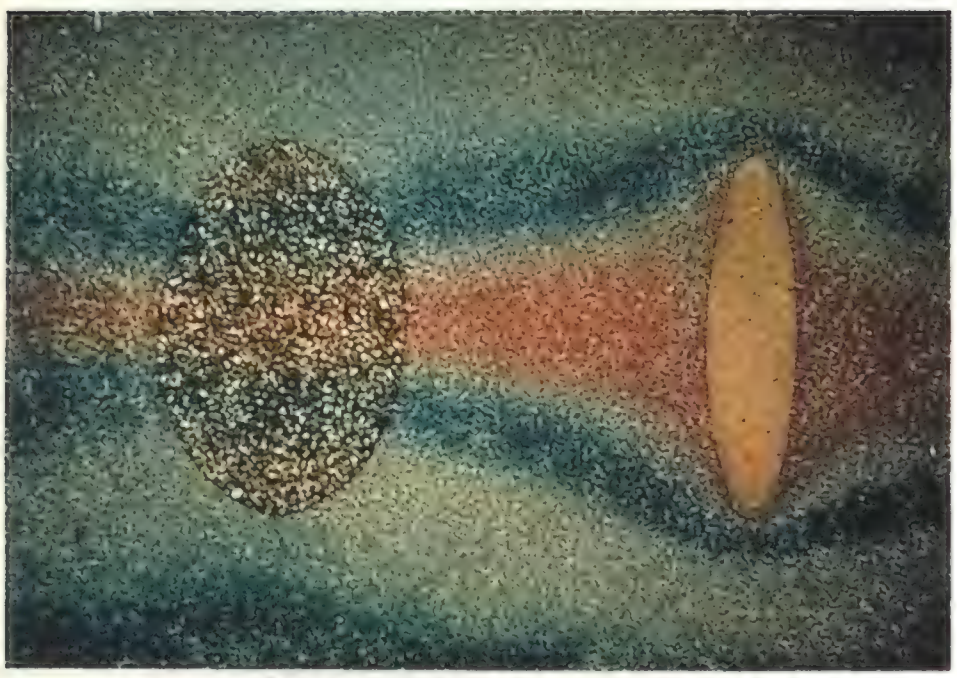
When rain falls here much of it disappears into depressions called sinkholes. These depressions, ranging from ten to 1,000 feet in width, occur naturally in response to several of the following processes: collapse of cave roofs, flushing of soil into caves, and solution of limestone beneath the soil. The sinkholes that have swallowed cars and houses in Florida, however, are commonly triggered by excessive pumpage of ground water and consequent lowering of the water table (p. 56). Water from the sinkholes and soil enters the tributaries of extensive cave systems. "In base-flow conditions," Quinlan said, "it may take 18 days for water to go five miles. After a heavy rain, it will go the same distance between the same two points in less than 24 hours." It moves in a branching conduit system and then emerges seven miles downstream at springs.

Quinlan has learned to understand this subterranean plumbing sytem so well that when a truck overturned recently he was able to predict where the cyanide leaking from its load would go. And that, alas, is the most pressing need for his marvelous knowledge, as it is for most ground-water studies these days: to be able to trace toxic substances.

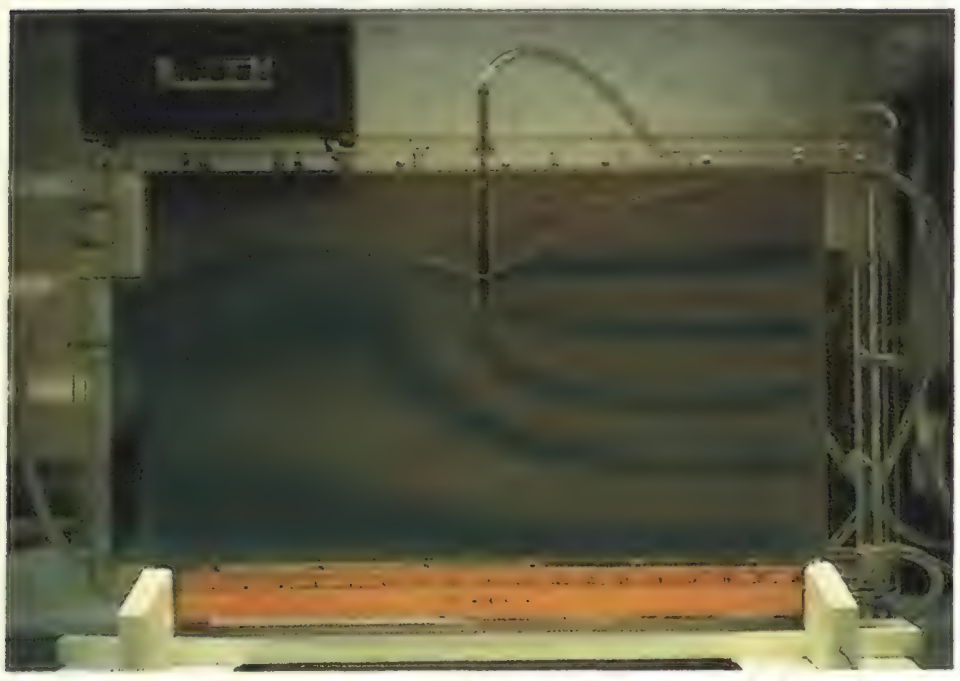
In other ways, however, the karst is not typical. "In the scheme of America's ground-water supplies there are no underground rivers and lakes," Jay Lehr insisted. "They're not part of 99 and 44-one-hundredths percent of America's ground-water supplies."

That dominant percentage of ground water, which is about 20 times as much water as we see on the surface, flows not through caves, but through tiny cracks and pores in rock, spaces between grains of earth or sand, gaps in gravel, or fractures where rock has moved. Like karst rivers, this water moves, but its speed is at the other end of the scale. Once a California geologist named John Mann, a patient individual, took a yardstick and a stopwatch out in his garden and timed a snail. Ground water, he then announced with authority, moves an average of about one-seventieth of a snail's pace.

Michael Parfit, a frequent contributor, wrote about Alaska's native corporations in the August 1981 issue.



In ground-flow model, dyed water is impeded by clay zone (right), drawn toward permeable gravel (left).



In another model, dyed water flows into V-shaped cone of depression, where well taps into water table.

"Five feet a day is superfast ground water," Lehr said. "It goes as slow as five feet a year. But it never stops." He was in his office at the National Water Well Association. In a corner stands a seven-foot model of a man made of galvanized ductwork (p. 52), given to Lehr by his staff when he completed the 1982 Ironman competition in Hawaii. He kept talking.

"The crust of the Earth is porous like a sponge. It's just all filled with water. You cannot drill a hole in the crust of the Earth without getting water in the hole. You may have to wait a couple of days, but it will fill up."

It will fill because water underground is never at rest. The standard cross-section drawing of an aquifer, used to illustrate depletion or pollution, shows a body of earth, symbolized by speckles, in which a cross-hatched level aquifer lies like a pond, sleeping in the soil. In its static outlines, this illustration is correct, but it's like a wax model of a friend: all it lacks is the animation, but that's everything.

"There is no stagnant ground water"

"Ground water is always moving," Lehr said. "There is no stagnant ground water. It is a world of friction. That's a key word. The potential energy that the water possesses is all used to overcome frictional resistance to flow, and create velocity."

The speed at which ground water moves depends on two simple things: how easily it can pass through its aquifer (the aquifer's permeability), and how steeply it is sloping downhill (its gradient). Up on the surface, water engineers trying to analyze stream flow have to factor in the confoundingly uncertain element of turbulence, but down below there is no such interference: the water moves serenely, undisturbed, through the pores. That makes it easier to grasp mathematically.

In the models that Lehr has made, ground water flows precisely, beautifully. The models are handmade of sandstone, standing between Plexiglas walls. Dye is inserted on one side at vertical intervals, and the water flows slowly across before your eyes. The dye makes stripes in the stone, and in an assortment of models the many things water does in stone are very graphically revealed.

In one model Lehr has sunk a little well; the dye lines bend smoothly towards the hole. In another he has sunk two dozen wells; when one is pumped, the surface of the water—the water table—in all the others lowers in proportion to how close they are to it: it's a model of what is called a pumping cone of depression. Likewise, pouring water into one of the wells creates what is known as a mound, a hump of water that slowly percolates out into the surrounding water table.

In another model water is partially trapped below

dry rock by a layer of clay; it becomes a confined aquifer, under pressure—when a well punctures the clay, dye spurts up from under the clay and the well becomes artesian, flowing out over the water surface. In a similar design the clay layer is vertical, like a dam, but the dye is never stopped; it works its way laboriously around and even through the obstacle. In yet another, parallel lines of dye move from one kind of sandstone into an area slightly more porous; the lines are uniformly refracted, or bent, through the different stone, like light through a prism.

In the days when Lehr alternated between sitting in the bottom of a swimming pool and staring at these models, among the things he came to understand was a particularly important phenomenon: although it took long periods of time for the dye to move across even a three-foot-long model, the pressure changes created by turning on a pump or pouring water into a well instantly affected the entire model. If you pumped one side of the model, dye moving away from it on the other side would immediately change direction; it might take hours to get there, but it was on its way. "That was a Eureka moment," he said.

One of the best examples of this phenomenon, and others, is a huge basalt aquifer that lies under a black desert in Idaho. Here, layers of broken basalt lie in a basin north of the Snake River to a depth of as much as a mile, and water from rivers that disappear into the rock fills every cranny. This is fast ground water here—five to ten feet a day—but it still takes three centuries or more to travel the 200 miles from wet meadows at the northeast end of the valley to the basalt cliffs at the southwest end, a place with a perfect name: Thousand Springs. Yet during only the past 70 years, the spreading of irrigation water from rivers onto the top of the aquifer has increased the flow of those thousand springs by a full third.

A watery farm for rainbow trout

I walked down into the canyon of one of those springs with the man who owned it, Earl Hardy. When you sit down at a restaurant to eat rainbow trout, chances are you're eating fish raised at a farm owned by Hardy or one of his colleagues in the valley of the Thousand Springs.

Hardy looked like a cattleman: silver hair, a lean frame, a thoughtful face. We stood in dry grass and sagebrush, with the sun high overhead and heat radiating from the black cliffs on either side, and we had to raise our voices to be heard over the roar of the water. It came out of the rock half a mile back up the canyon, boiling over a falls in front of us.

Except for pollution, the quality of ground water depends on the kind of rock it moves through, and how

Earl Hardy plans to raise trout at Box Canyon Spring; he is concerned about nuclear wastes to the north.

Hydrologist Jack Barraclough is tracking radioactive wastes; Tritium has moved only eight miles in 30 years.

Winter Park, Florida, sinkhole measuring 350 feet in diameter, 100 feet deep, caved in during 1981 drought.

fast; the basalt here is not very soluble, so this water was unusually clear. We knelt by the stream and drank. The water was cold and good. "There's something special about this," Hardy said.

There was. It was a place of extravagant abundance. But even here the troubled future of ground water was to intrude.

The first uncertainty is quantity. More and more irrigation wells, tapping ground water, have been sunk in the Snake River aquifer, bringing improbable polka dots of desert into sudden bloom, so today the water pressure built up by all that previous river irrigation is subsiding. The flows are going back down. There are options, however. Hardy and a group of crop and fish farmers have filed for the rights to millions of gallons of spring flood waters, and hope to put them back into the rock 50 miles up the aquifer. The water may not get here in Hardy's lifetime, but the pressure will.

The second concern is less immediate, but perhaps more ominous. Again, consequences.

Since 1952 a nuclear-energy research station run by the U.S. Department of Energy about 120 miles east of Thousand Springs has been disposing of low-level nuclear wastes into the aquifer. Tritium, Strontium 90, Cesium 137, Iodine 129 and other isotopes have gone into the water and fanned out southwest from the disposal areas in a shape that is called a plume. Because of ground water's deliberate pace, the plume has not yet gone very far.

"The Tritium, which moves almost as fast as the water, has moved about eight miles in 30 years," said Jack Barraclough, a U.S. Geological Survey hydrologist who has spent 20 years of his career tracing it and the others (p. 55). "The others have shorter plumes. They don't move as well with the water. The Iodine has only gone about two miles. These contaminants are largely going to stay out of Man's environment."

Still, Barraclough looked worried even as he uttered reassurances. He hoped that the jumbled layers of lava in the plain might be divided with dikes of newer flow. "In Hawaii dikes impede the flow. If they were here they could be a blessing to this radiation."

At the speed even of this aquifer, it seems unlikely that the grandchildren of anyone now living will notice an Idaho trout glowing on the plate. But the fear of radioactivity and the mystery of ground water do not combine to make peace of mind. Farmers pump from below the desert closer to the disposal site than the springs, and Iodine 129, a deadly poison, is more patient even than ground water. It has a half-life of 16.4 million years.

While we stood on a ridge above the Box Canyon Spring, I told Earl Hardy of Jack Barraclough's promise that the wastes were no danger.

"I hope they're right," he said.

Clear on the other side of the continent the setting was different, but the problems were the same. Aquifers tend to be well-defined bodies, underlaid by impermeable rock or salty water, bounded by mountains or, as in the case of Long Island, the sea. In terms of ground water, Long Island is a microcosm of the nation. It has it all: agricultural irrigation, urban water supply, pollution and, above all, a straightforward, ordinary aquifer system that is its entire source of water. No crazy karst, no exotic basalt, just 180 cubic miles of sand, clay and gravel sponge.

Seven million people living on a sponge

Since almost seven million people live on that sponge, and many of them drink from it, just about all of the things that Jay Lehr ever modeled have happened here. The most spectacular example of a cone of depression, formed by pumping, occurred under the New York City parts of Long Island during the first half of the 20th century. There, so much water was pumped out of the ground that the water's surface dropped as far as 35 feet below sea level in the center of the cone. Salt water then pushed in from the coast, and forced the city to abandon many wells and to import surface water. Slowly the water levels came back. Surprise! A lot of subways and basements were built in the days of heavy pumping, and when the water returned *they* had to be pumped.

There are mounds, too, in the aquifer. On a sunny afternoon when I drove through part of Nassau County with a USGS technician, we kept passing

big, weedy, shallow basins by the side of the road. They looked like formal imitations of karst sinkholes, and in a way that's what they were. Long Island has appreciated ground-water flow longer than most areas, and for years it has piped its storm runoff not to the sea but to these recharge pits. An average of almost three billion gallons of rain per day falls on Long Island; the pits help the ground absorb about one million gallons per day per square mile. Because of these unusually advanced methods of dealing with runoff, Long Island is in far less danger of running out of water than of getting short of good water.

"All our problems are quality problems," said Tom Riley, a USGS hydrologist on the Island. Long Island's water story is a tangled string of consequences. On Long Island people have put just about everything into the ground, and more and more of it is now coming back up—the nitrates and phosphates from septic tanks, pollutants of all kinds from landfills, pesticides and, most recently, organic chemicals (some, ironically, which are used for cleaning things on the surface).

But though some water supplies on the Island have already been seriously damaged, the trouble is more threatening than it is acute. "We're talking more about problems for future generations than of impending doom," Riley said. "We still have a viable water supply. We'd better be careful."

In the unturbulent flow of ground water, plumes of waste may drift for years, and who knows what system they may ruin, in whose generation? In the early 1960s, everybody thought organic chemicals unimportant, that the soil would take care of them. But they started popping up—the solvents, degreasers, the septic-tank cleaners people had been releasing since they were invented. Among them was the popular solvent, tetrachloroethylene, better known as TCE, a carcinogen that has become one of the most widespread of all detected ground-water pollutants. TCE was undetectable until recently. What else remains unseen?

The premier ground-water research lab in the country, according to Jay Lehr, is the Environmental Protection Agency's Robert S. Kerr Laboratory in Ada, Oklahoma. An important focus of work there is on something most people would find it easy to overlook: life in the aquifer.

"Until a few years ago, all we knew of the biosphere

Dry irrigation ditch on abandoned farm in Coolidge, Arizona, is result of intense "ground-water mining."

Texas district manager Wyatt checks pressure of air pumped underground to raise water table artificially.

Ty Coplen at the U.S. Geological Survey in Reston, Virginia, traces water source by identifying isotopes.

was from the Earth's surface up," said James McNabb, a loquacious and enthusiastic microbiologist at the lab. "Back in 1973 we weren't really sure there were any 'bugs' down there."

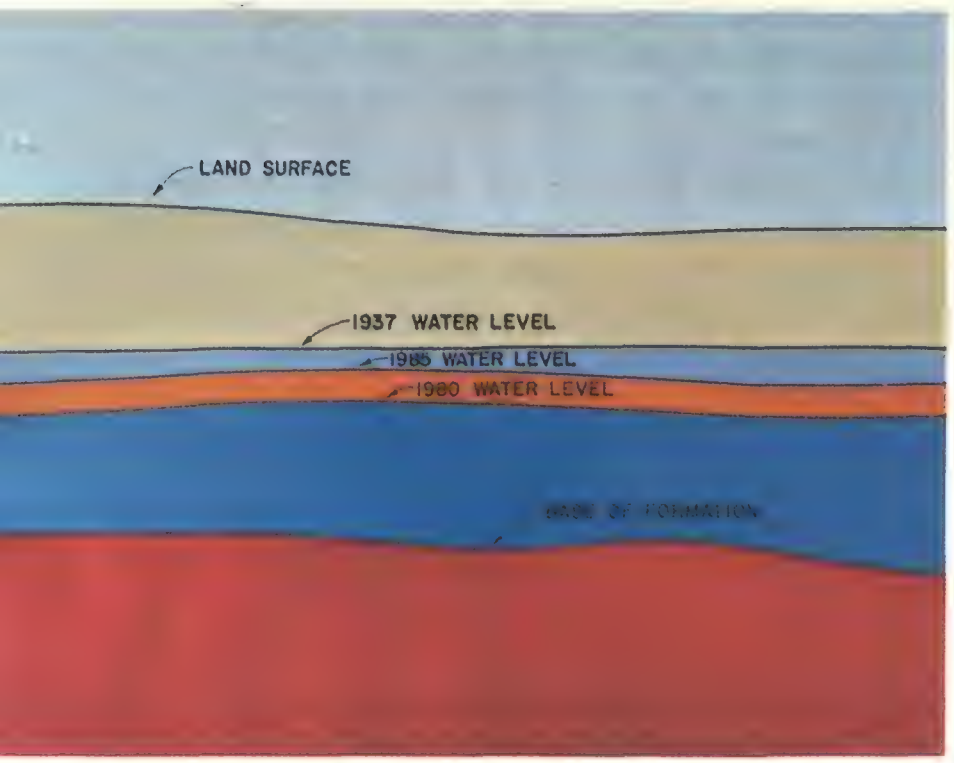
On the walls of several of the offices at Ada are copies of an electron micrograph of a bug, found in subsurface material—a creature that looks, in the picture, like the shadow of a molecular model: globes joined by sticks. No one knows what it is.

"Suddenly this world beneath us is another world for science," McNabb said. "We're finding organisms we've never seen before. Subsurface microbiology is exciting from a scientific viewpoint, but it's also very practical. Now we know they're there, in pretty high concentrations, but the question is, will they do anything? Will they chew on these man-made substances we're putting in there?"

The answer is still unknown.

Hydrogeologists have been trying to answer aquifer-wide questions by simultaneously analyzing the flow at thousands of points. Until computers became efficient, the primary modeling agency, USGS, actually built big electrical grids as models through which electricity ran like water, with resistors simulating rock at each studied point. Today, however, multiple equations have replaced the resistors, and the computer runs the water through the aquifer in its circuits.

Computers are now helping hydrologists resolve many of the unknowns about aquifers—helping them to predict where a plume of pollution may go when it bends through several lenses of rock, or to tell the farmers of the High Plains states for approximately



In Wyatt's chart, water table rises from 1980 low to 1985 level, after injection of compressed air.

how long they can depend upon the Ogallala aquifer.

That, of course, is the great modern ground-water mystery. The Ogallala has done more to bring ground water to the public's attention than even Jay Lehr. This 156,000-square-mile swath of sand and gravel, which runs from the edge of South Dakota into Texas, is declining. It is the largest single example of what is called the mining of ground water: removing more than is being naturally replaced. Irrigators in Texas get a water-depletion allowance based on the assumption that eventually the water will be gone, and in some areas that time may come in this generation.

The farmers of Texas are using four to six million acre-feet of Ogallala water a year; the recharge from rainfall is only about 200,000 acre-feet. Various estimates see between two and four million acres of agricultural land in Texas turned back to dry-land farming in 40 years.

To Bill Clayton, a farmer and former Speaker of the Texas House of Representatives, the answer is conservation and, eventually, surface water. "There'll be interbasin transfer of surface water, interstate, maybe international," he predicts. Aware of such thinking, the governor of Arkansas recently sent a jar of his state's water to the governor of Texas, with a note: "This is all you're going to get." And although the Ogallala problem has led to some startling news stories, there is disagreement on how terrible the crisis really is.

"I'm more optimistic than most of the stories you read," said Wayne Wyatt, the manager of the High Plains Underground Water Conservation District in Lubbock, which covers much of the Texas part of the Ogallala aquifer.

"If we practice all the current water conservation technology, by the year 2020 we'll be down to 3.2 million acres irrigated from the current 5.5," he said. "To me that's not all that bad, in 40 years, not when you compare it to people saying we're going to be out of water by 1985. And that's assuming we aren't any smarter than what we are right now, that we just sit on our fannies. There's a lot of things in the making that can improve the current technology." Among these possibilities is his district's effort to make more water available for pumping by injecting air under pressure into wet sand, thus breaking the surface tension of the water in the sand.

Wyatt grinned. "I have faith in the Yankee," he said.

But even Wyatt foresees canals. It is as if there is something reassuring about water that comes to you in a ditch; at least you can see it. As a nation we seem far more willing to spend money on water we can see than on that mysterious underground source which, if you believe Jay Lehr, could help solve the water crisis that some anticipate.

"This country has accessible well-water reserves 20 to 30 times greater than all surface-water supplies," he said. He would sound cantankerous if he weren't so enthusiastic about it. "And yet the nation uses three times more surface water than ground water. That's crazy!" He paced around in his office, before going to his weight-lifting workout. He had been writing a proposal for several cities in Illinois that are currently planning to build $1 billion worth of pipelines from

EPA scientist James McNabb uses microcosms of aquifers to study problems of ground-water pollution.

Lake Michigan. His solution is to pump water into the aquifer right near the lake; increased pressure will zip inland faster than you can build pipes, and it will never corrode. He continued:

"Why do people ignore ground water? First, out of sight, out of mind. Second, the government has bunches of programs to develop surface water; none to develop ground water. Third, engineers who design water systems would much rather design a dam than a well. Fourth, you've got your city fathers. They're the plaque people. Want their name on something. And finally, the water witches. If what you know about ground water is what you heard from the local water witch, wouldn't you rather have the water sitting out there in a nice pond where you can see it?"

But increasingly, necessity is focusing attention on ground water, and science is making it more manageable. One of the cleanest ways of finding out where the water comes from is to look at the water molecules themselves. The ratio of rare oxygen and hydrogen isotopes to common ones in rainfall varies geographically in ways that can be charted. Find the ratio in a water sample and you have a good idea of its source. "We can tell the difference in water less than a mile apart in a basin with two sources," said Ty Coplen, who works at the USGS headquarters in Reston, Virginia.

Every drop of water is accounted for

"Every drop of water in the Southern California coastal plain within Los Angeles County is accounted for," said Jack Reinhard, a civil engineer for the Los Angeles County Flood Control District, who gave me a tour of recharge basins in the San Gabriel Valley. Every drop of water used here is also paid for, whether or not it comes from the ground, and the whole basin is controlled by a water master, who can regulate disputes between, say, well users who want the water level high and gravel-pit owners who want it lower.

This kind of flexible management begins to look like Jay Lehr's ideal. Ground water and surface water must be used together, he insists. The drive to flatten nature, to try to make each day and year and decade similar and predictable by building huge dams and aqueducts is, to him, a massive error.

Lehr slapped the table with both hands. "We don't work with nature. We're stupid!"

He sat there in the sun in his shorts, the marks of his parachute harness still on his shoulders. He had just completed his 230th career jump, riding cheerfully down on his reserve after his main chute failed. Waiting for another ride into the sky, he was back to ground water.

"We have to develop the confidence to take water out of the bank account—the ground water—knowing that nature will put it back in. In the drought period we want to pump the hell out of our ground water. By using it we make room in the bank for another deposit that comes in the flood."

Lehr jumped up. His plane was ready. He grabbed his chute. "In 1968 people couldn't spell ground water," he said. "They thought it was water in a puddle. Today it is hard to pick up a newspaper without finding a ground-water story. Man, we have won a huge victory. We got the country's attention." He was gone.

What did he see as he leaped from the open doors above the wet Earth? Over the horizon, in southern Ohio, several companies were working to clean up a

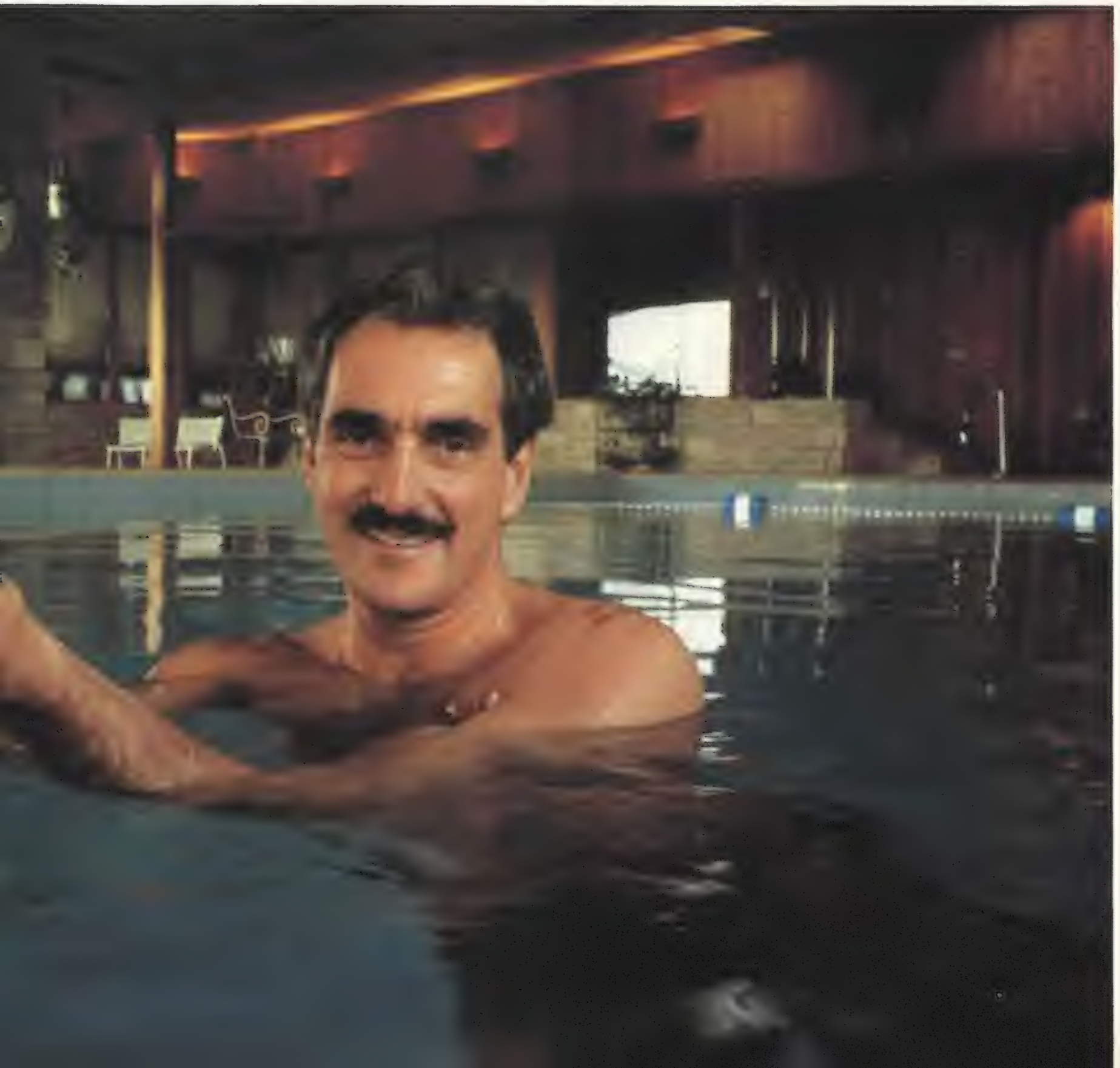
Jay Lehr, in ground-water-filled swimming pool, says "There are no insoluble ground-water problems."

horrible chemical spill into the ground water. There is nothing mysterious about cleanup, if you know how ground water works. Sometimes it can be done. There's nothing mysterious about preventing pollution either, if you know that what you do to the land will be reflected beneath.

Way out West, in the parking lot of the apple cannery, Wayne Thompson, the cheerful water witch, had brought in a beautiful well under his red cross; but the other dowsed hole, of the farmer near Clovis, came up barely moist. As always, no proof out there for the occult.

"There are no insoluble ground-water problems. None." It was now twilight. Jay Lehr stood beside an Olympic-size swimming pool full of ground water pumped from a well nearby. He was about to begin a two-mile swim. "There are problems that may get out of hand. But they're being addressed. I'm the most optimistic person in the country. No one will be able to sell a crisis in 1990. There will be plenty of water. Now that we have the attention, we'll get it done."

He spread his hands across the water, preparing to dive. He grinned. He said: "When I was a kid I always wanted to be Superman." Then he closed his fierce eyes, leaned forward and, with a great splash, plunged into his element.



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By Ruth Daniloff

Restoring a Russian heritage turns out to be a Byzantine task

Preservationists are now battling industrial pollution, unwieldy paperwork and centuries of damage—but at least they've got money

"When it is really cold, say ten below, we have to work inside," confesses Volodya, a small man dressed in a padded cotton jacket and felt boots, as he steps over a pile of snowy rubble to enter the chambers where Boris Godunov retired before accepting the Russian crown in Pushkin's celebrated play. Today the temperature reads minus 15 and Volodya's breath condenses on his beard.

Volodya, a one-time history major at Moscow University and now a stone mason, is one of a brigade of restorers working on Novodevichy, an enormous 16th-century convent on the bank of the Moscow River where Peter the Great and other Russian noblemen forced the veil on women who interfered with their plans. Novodevichy (pp. 66-67) was founded in 1524 as a religious retreat for high-born women, though with its turrets and huge white crenellated walls the convent also served as a fortress to repulse the Czar's enemies.

Wooden planks straddle gaping holes in the rough stone floor of the tiny palace, which leads into a dilapidated 17th-century church containing a cement mixer, bits of scaffolding and a workman's leftover lunch. Over the years, floors were laid one on top of the other, explains Volodya, wiping his sleeve across his nose, "but architects can tell which level to stay at by the distance from the windows." Volodya became interested in restoration while working at the Moscow Historical Museum. "I watched restorers work and saw at first hand what they did. I decided that I wanted to restore old historic buildings. So many are in decay."

Volodya is not alone: 66 years after the Russian Revolution, the Soviet Union is restoring the Czarist past (SMITHSONIAN, May 1972). Soviet citizens are ready to lie down in front of bulldozers, sign petitions, write letters and pressure unresponsive bureaucrats in order to preserve their heritage. Old women who drop ten kopecks in the church restoration box to save a beloved icon are not the only ones involved. For many people, especially the young, preserving palaces, paintings, icons, churches and other historical treasures has become a personal mission.

"It was crazy what some of the early Soviets wanted to do. They wanted to build a new society without taking into account what went before. It was cultural suicide," says one architect working on the plans for the restoration of a 17th-century brick monastery overlooking Moscow. His office there is housed in a ramshackle building. Opposite his worktable is a detailed design of what the monastery will look like when it is finally restored, plus a map of Moscow with red and blue dots marking historical buildings.

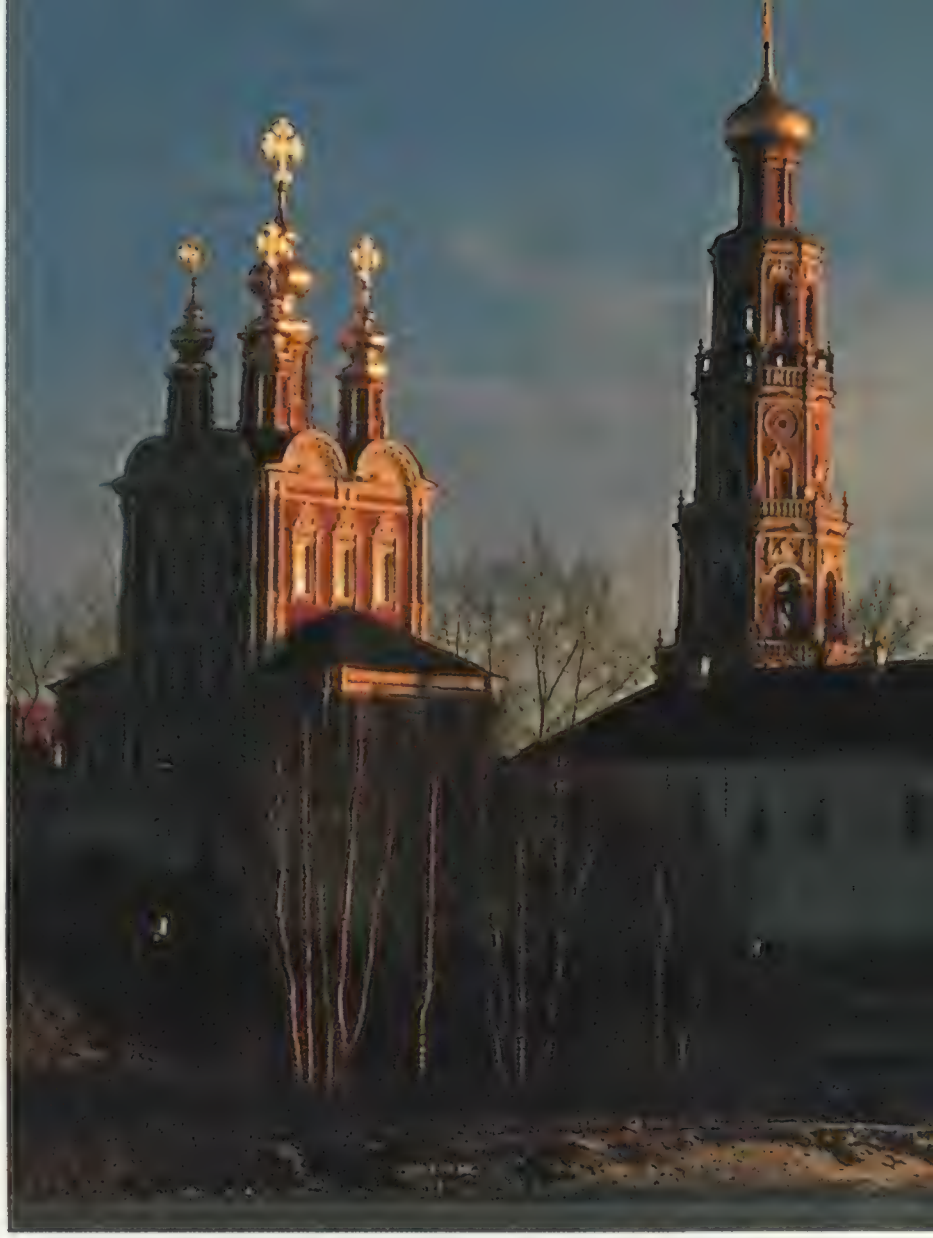
Like many people waging the battle to save old buildings, this architect-restorer is a so-called Russophile. He even discounts the Russian avant-garde period at the beginning of the 20th century, which spawned such influential painters as Chagall, Kandinsky and Malevich, as "an aberration that went nowhere." Russian culture, he insists, is rooted in Eastern Orthodoxy, which was introduced from Constantinople to Kiev by the Grand Prince Vladimir a thousand years ago. Over the centuries this Byzantine art and architecture acquired its unique "Russianness": the exterior stonework cut to resemble ancient Russian timber carving, the onion domes pointed against the heavy snow, and the Western influence introduced by Italian and French architects employed by various Czars in their efforts to Europeanize their country.

Though Lenin proclaimed prerevolutionary art and

St. Basil's Cathedral was repaired and repainted in 1948, then spruced up again prior to 1980 Olympics.

Photographs by Rhoda Baer

Chesme Church in Leningrad, built for Catherine the Great, has benefited from continual maintenance.



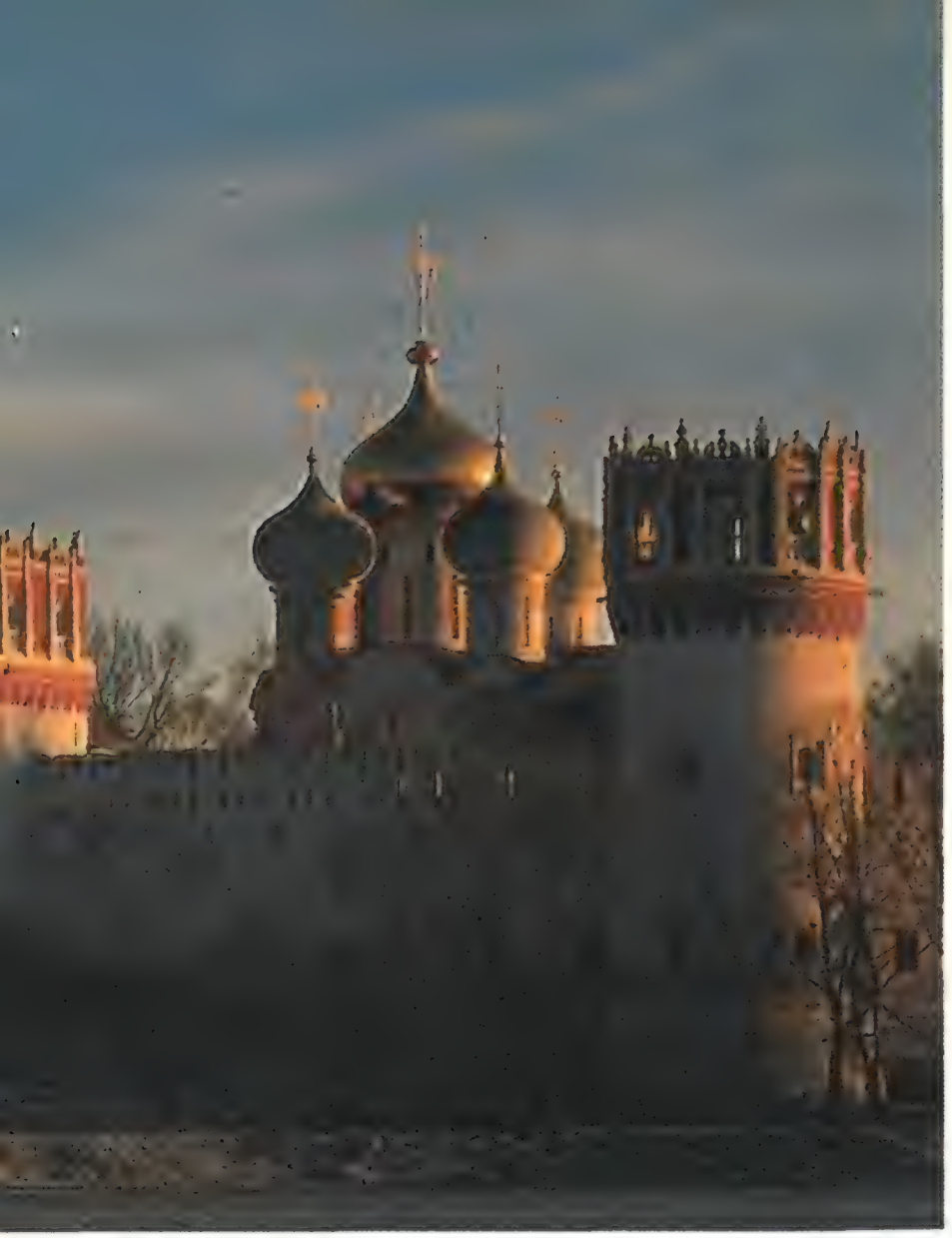
Novodevichy, graced by onion domes of Smolensk Cathedral, was founded in 1524. Women of noble birth

architecture the property of the people and worth saving, others in power later argued that the past, particularly when associated with religion, must be eradicated. Moscow was built by a drunken *muzhik* (peasant), claimed Lazar Kaganovich, one of Stalin's chief henchmen and Moscow's party chief in the early 1930s. The city should be pulled down and rebuilt. Soon wreckers moved into the Soviet capital and other cities around the country, destroying old buildings to make way for new apartments, schools, metro stations and prisons. About half of Moscow's 520 churches were razed, while others became warehouses, workshops, factories, offices and clubs. Of the 18 churches located in and around the Kremlin, only nine survived.

The losses mounted. In 1931 Moscow's famous Cathedral of Christ the Redeemer, built to commemorate the Russian victory over Napoleon in 1812, was dynamited to make way for the proposed Palace of Soviets, a gigantic structure to be topped by a mammoth statue of Lenin, whose little finger alone would be almost ten feet long. But the site proved too boggy for such a grandiose edifice. Instead, an outdoor swimming pool was installed where the cathedral had stood. Stalin was also rumored to have ideas for dismantling the brick Kremlin and remaking it in stone and marble, but the project reportedly proved too expensive. In the spring of 1936, St. Basil's Cathedral in Red Square (p. 65) was scheduled to be blown up to make more space for military parades. Only when 43-year-old Petr Baranovsky, one of the great heroes of Russian restoration, threatened to chain himself to this exotic cathedral and perish in the rubble did Stalin rescind the demolition order.

The Second World War dealt a further blow to Russia's crumbling heritage. Hitler's invading armies razed many ancient cities. According to the Soviet Ministry of Culture, more than 3,000 precious monuments were destroyed by Nazi bombs and tanks, including cathedrals in Kiev, Chernigov and Vitebsk. One of the worst losses was the series of late-12th-century frescoes in the old Church of the Savior, on the Nereditsa River in Novgorod. In Leningrad, during the 900-day siege, German shells tore through the roofs of palaces, churches and mansions, the oldest of them dating from the reign of Peter the Great in the early 18th century.

Free-lance writer Ruth Daniloff, who wrote about the Beale treasure hunt in the April 1981 SMITHSONIAN, *is currently living in the USSR.*



were sent here, but it doubled as a fortress. Now it is one of the major restoration projects in Moscow.

Begun in 1420, Redeemer Cathedral is Moscow's oldest building. It was totally reconstructed during 1950s.

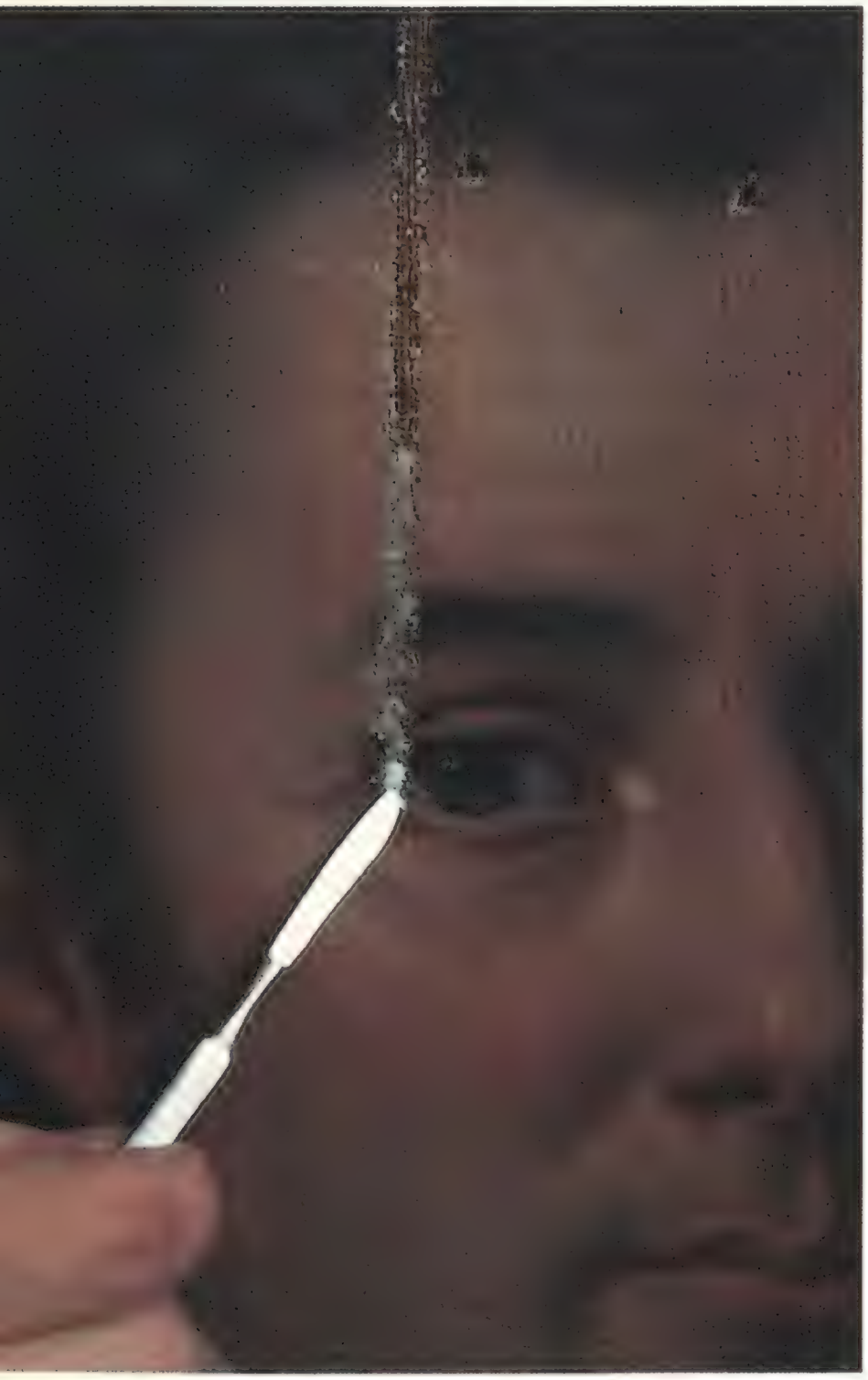
Luckily, there were also survivors in Leningrad and other cities. Leningrad's gemlike Chesme Church (opposite), designed for Catherine the Great, and 18th-century St. Nicholas Cathedral, with its regal bell tower (p. 73), came through unscathed, as did 17th-century Kazan Cathedral in the town of Kolomenskoe, a Czars' summer residence in Moscow (p. 72). Chesme Church, though no longer in active use, has received continual care, while the latter two, as working churches, have been maintained by their members.

At the end of the war the Soviet Union began picking up the pieces and embarking on the seemingly impossible task of tracing art objects that had been scattered around the country and returning them to their former homes. Restoration began on the Czars numerous country residences such as Petrodvorets, Peter the Great's palace (which was designed to rival Versailles); the Catherine Palace at Tsarskoe Selo, now Pushkin (pp. 70-71); and the Great Palace at Pavlovsk (p. 70). Their splendor suggests to some why the Russian Revolution erupted. Other buildings were totally reconstructed. The oldest one in Moscow, Redeemer Cathedral in the Andronikov Monastery (above), was rebuilt in the 1950s after years of careful study, including analysis of its stones for clues to its construction.

During the past 15 or 20 years, as Soviet citizens' fascination with their history increased, the battle to reverse the damage caused by years of abuse and neglect took on added urgency. In 1965 Ilya Glazunov, who is a painter and leading figure in the movement to preserve old Russian culture (SMITHSONIAN, December 1977), and a group of his friends—writers, poets, scientists, academics and artists—formed the All-Russian Society for the Preservation of Historical and Cultural Monuments. Of the Soviet Union's 15 republics, the Russian Republic suffered the most neglect, explains Glazunov, who attributes this to a greater sense of ethnic pride in other parts of the USSR. Each member of the Society, which today stands at 13 million, contributes 60 kopecks (90 cents) a year to restoration projects—plus time and energy. On a day-to-day basis the Society operates largely independently, though ultimately the Ministry of Culture of the Russian Republic has the last word.

The Society's initial undertaking was to target monuments worth saving, a task still going on today. With the fervor of Peace Corps volunteers, young people fanned out across the country to document buildings and their contents. "If you list everything in a church and then make a local official sign it, people will

Dr. Ivan Gorin basks in restoration of 17th-century frescoes, which were once debris on a cathedral floor.



Repairing an old portrait, a Russian conservator lays filling material over rewoven threads with scalpel.

think twice about letting their cows sleep there. The idea was to make someone responsible," explains one young woman who took part in the excursions prior to emigrating to the West five years ago.

Enthusiasm among Soviet preservationists is high. History lovers gather in small groups to discuss a particular building, listening to a volunteer researcher trace the architectural metamorphosis of an old mansion from the residence of a rich merchant's mistress to a scientific institute, which turned the original 19th-century ballroom into offices, thereby destroying unique moldings on the ceiling. The cinema section of the Society awards special prizes for several categories of films about old buildings. Other members travel the countryside in their spare time compiling pictorial archives. Arguments take place in the pages of Soviet journals and newspapers: Do the original drawings of such and such a church call for five domes or seven? How best to restore a building built in the 17th century, but heavily remodeled in the 18th? "The articles are so well researched that the government can't be completely negative. They have to take some notice," says one architect.

It seems that they have. In 1976 the Soviet government passed the first comprehensive law protecting

Outspoken painter Ilya Glazunov, founder of Russian preservation society, stands among restored icons.

ancient buildings and stipulating how they should be used. A year later, under Article 68 of the new Soviet constitution, it became a Soviet citizen's patriotic duty to preserve the past. The export of antiques without a permit was forbidden, stemming the exodus of Russian art treasures that began after the Revolution, when the Soviet government sold such prized items as Fabergé Easter eggs and icons to Western collectors like Armand Hammer and Marjorie Merriweather Post. "People were starving and willing to sell for practically nothing," observes one Soviet art historian bitterly. Today agents from the Soviet Ministry of Culture, which has overall responsibility for restoration, scour the Western auction houses with the idea of buying back some of their lost art treasures.

But regardless of the Soviet government's commitment to preservation—as witnessed by the number of buildings surrounded by scaffolding—restorers, like restorers everywhere, complain that not enough is being done. Their enemy is the government's planning commission which, like most government planning commissions, tends to emphasize the industrial future over the cultural past. Moscow, for example, has a new five-year plan which is budgeting 340,000 new apartments, 100 new schools, 200 kindergartens, 57 clinics, 28 automated telephone exchanges plus 85 miles of new pavement and 15 new metro stations. What hope can preservationists have against the unmet needs of a city of eight million people where one-fourth of the citizens still live in communal apartments?

Not much, says Ilya Glazunov (left), whose controversial canvases with back-to-Russian-roots motifs scandalized Soviet authorities when he started exhibiting 15 years ago. These days Moscow city architects work from a master plan for the development of the Soviet capital, which was adopted in 1971. Glazunov and others maintain that this plan merely perpetuates the ideas of the 1935 general plan, which called for the elimination of all buildings in the paths of 16 projected avenues leading into the city center. Glazunov concedes that the 1971 plan reduces the number of avenues significantly, thus lessening the threat to a number of buildings. "That is one of our victories," he says; but he adds that the main emphasis in Moscow continues to be on new buildings. Glazunov is currently more or less accepted by the Soviet authorities, painting their portraits in exchange for the freedom to exhibit abroad and agitate for the preservation of old Russian culture. Unfortunately, he says, "in trying to meet housing needs, the government has the tendency to copy American boxlike structures."

Despite pessimism, Glazunov admits to some success. In 1972 when bulldozers started to tidy up an old square near the Kremlin prior to the arrival of President Nixon, some members of the Society took to the streets. Glazunov, Baranovsky and others confronted the wreckers who were working around the clock and

An overpainting, its image intact, is removed from a 16th-century icon—revealing another painting.

Trompe l'oeil painting transforms outside wall of the Great Palace at Pavlovsk, a 1970 restoration.

Ambitious effort by team of Russian restorers saved the 1,000-foot-long Catherine Palace at Pushkin.

succeeded in saving several historical mansions. To this day, Muscovites jokingly refer to the area as "Nixon Square." "We even managed to save St. Simeon's and now everyone says how nice it is," says Glazunov, naming a 17th-century church that was also scheduled for demolition.

Some see more improvement in the climate for restoration than Glazunov does. "The chief architect of Moscow has changed his position on preservation," says one leading architectural expert. "He used to be for tearing down buildings. Now he is staunchly for preserving historical monuments."

Apart from wrestling with bureaucrats and the results of modernization and past neglect, Soviet restorers of buildings and art objects are also fighting on a totally different front—industrial pollution. "Traditionally, restoration has been a trade, not a science," says Dr. Leonid Lelikov, in an impeccable British accent. "All over the world, say for the last 500 years, things have been more or less stable. But now it is necessary to have a new level of skill because of the poisons and chemicals in the air. Most traditional methods are no good." Lelikov, one of 300 research specialists at the USSR's National Research Institute of Restoration, is preparing textbooks for future generations of Soviet restorers. The Institute, under the direction of Dr. Ivan Gorin, a leading authority on icons and a member of the conservation committee of the International Council of Museums, specializes in developing new methods for restoring art objects such as paintings, icons, old manuscripts, furniture, textiles and sculptures in stone and wood.

Ninety percent of Soviet restorers are not trained in the latest techniques, bemoans Lelikov. "They tend to use strong solutions to remove layers of paint to get down to the original, but the destroyed layers contain information that is useful to art historians and restorers. We are talking about what should be six or seven operations instead of one."

The Soviets have won world acclaim for the restoration of paintings, especially where it comes to the removal of paint and varnish. Icons, more than other works of art, were retouched or totally repainted. Fifty to 100 years of being available to the faithful in a damp, candlelit church was enough to blemish and darken the features of any glowing Virgin. Over the centuries, as the icons were repainted, the faces would change from the austere two-dimensional Byzantine look of the early 12th-, 13th- and 14th-century icons to the more fleshy realistic features of later eras.

The most dangerous part of restoring a painting or icon is removing the old varnish or paint, explains Dr. Gorin. He describes the method of removing a coat of varnish in such a way that one very thin layer is left to protect the original paint. With a specially developed technique it is possible to produce several icons from one by lifting the separate layers of paint (p. 69) and attaching them to new backings. "In practice we can do this with four or five, even six layers, providing there are varnish layers between the different tempera repaintings," says Dr. Gorin with pride. Restorers there also repair broken canvas by the skillful reweaving of threads (p. 68), which they claim leaves the surface smooth on both sides.

While the Soviet Union can boast of impressive accomplishments in restoring the past, much remains to be done. It is always easier to make plans than to implement them, observes Moscow's Chief Architect, Mikhail Posokhin, pointing to the 14 major restoration works that are scheduled for completion by 1990. The projects he refers to are not single structures but enormous monastery complexes containing many churches and buildings within their large perimeters.

Money, strangely enough, is not the main problem. The Society alone has a surplus of 200 million rubles in the bank. "Still, we are spending 20 to 30 times more than five years ago, and it is growing all the time. Some of that, of course, goes for maintenance," explains one active member of the Society.

"Money! We have money!" laughs Dr. Gorin, throwing out his hands to show how much. "What we lack is enough specialists. We don't have enough experts in economics and agriculture, let alone culture."

Only four cities in the Soviet Union offer education for restorers at art institutes, with only eight to 15 people admitted each year. To become a top restorer in the Soviet Union takes from ten to 15 years, depending on whether the person has a university degree or not. In order to increase scientific expertise in the field, the National Research Institute of Restoration has both an apprentice program and a program to teach veteran restorers the latest techniques. Despite his complaints about the lack of experts, Dr. Gorin also points to tremendous progress. When he moved into his current headquarters at Novospassky Monastery some 20 years ago, several Soviet families and their cow inhabited its 17th-century cathedral, where frescoes are currently under restoration (p. 68). They had been found lying in piles of debris on the floor.

Perhaps the most annoying problem endured by Soviet restorers is an unwieldy bureaucracy that can hold up projects for months, even years, by making it difficult to get the necessary papers—and then the necessary materials. "The fine white stone used to make certain churches comes from particular quarries. But today a lot of it is being ground up to make roads, so we have to make do with inferior stone which won't last," complains one architect who criticizes the quality of some restoration work, especially the buildings that received hurried face-lifting for special occasions like the Olympic Games or the visit of an American president. Last year several Soviet restorers were indignant when bricks especially cut to size for restoration work were allocated for the construction of the new U.S. Embassy in Moscow. The American contractors, it turned out, had refused to use the regular Soviet bricks provided for them.

With all the headaches encountered by Soviet restorers, it is easy to overlook progress. Amid complaints about shoddy materials, old methods, and paperwork, it is hard to recall the time when people threatened to chain themselves to old buildings. Petr Baranovsky, now a fragile man of 89, has painful memories of his defiance of Soviet authorities, which ultimately led to three years in a prison camp. "They were very bad times," he says as he sits amid piles of dusty files and books representing more than 60 years as one of the most respected architectural restorers in the country. "People didn't understand what they were doing. It was a shame. They didn't know what was beautiful."

The grand old man of Russian restoration is finishing out his life in a tiny apartment on the grounds of Novodevichy. From his window he can see the domes of 16th-century Smolensk Cathedral, which contains examples of some of the finest restoration of frescoes in the country. Young restorers occasionally drop by to pay their respects, bringing him a box of candy or a few apples. And on Sundays, if there isn't too much snow, he walks across the grounds to attend a service at one of the working churches, secure in the knowledge that it will be preserved for future generations.

At restored Moscow town, Kolomenskoe, members of a 17th-century church bring cakes for blessing.

Gold-capped bell tower of St. Nicholas Cathedral in Leningrad has been maintained by its parishioners.

The Chromium Mechanism

The first comprehensive explanation of electrochemical activity during the plating of chromium has recently been formulated at the General Motors Research Laboratories. This understanding has aided in transforming chromium plating into a highly efficient, high-speed operation.

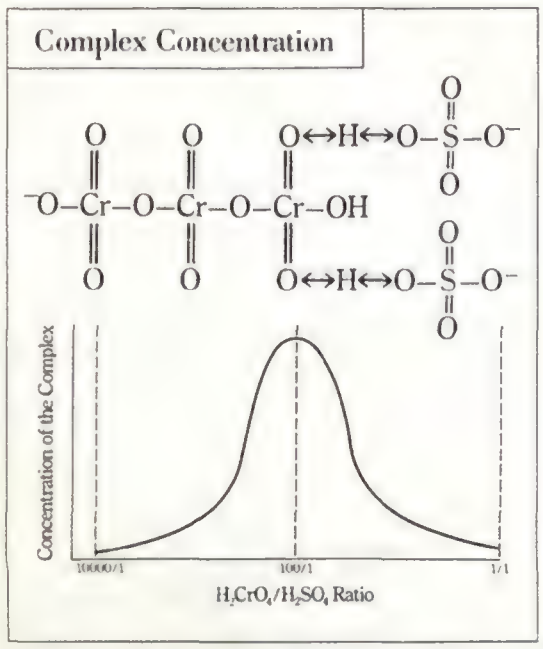


Figure 1: The electroactive complex and a theoretical plot of its concentration as a function of chromic acid to sulfuric acid ratio.

Figure 2: The electroactive complex diffuses from the bulk electrolyte solution (A) through the diffusion layer (B) to the Helmholtz double layer (C) to be discharged as metallic chromium (D) on the cathode (E) surface.

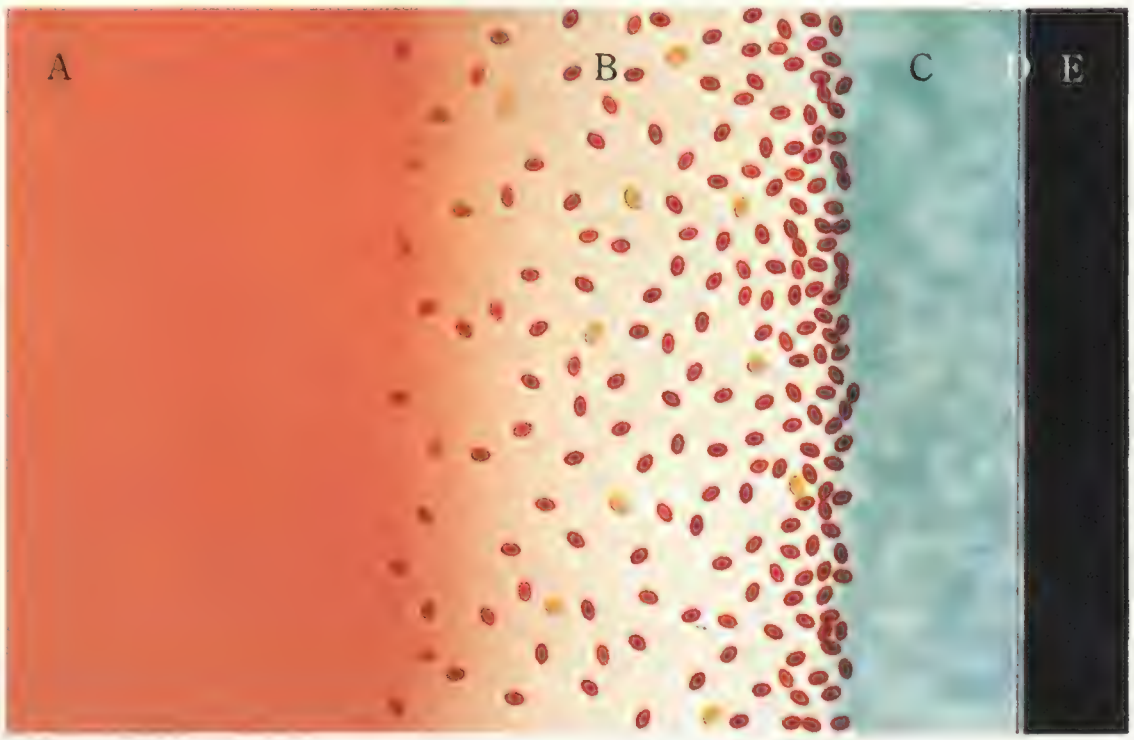
FOR MANY industrial applications, chromium coatings of more than 0.2 mil thickness are required for wear and corrosion resistance. But the conventional method of plating chromium is neither fast nor efficient. Nor, until the recent work of a GM researcher, had the steps involved in the century-old plating process been explained in detail. Through a combination of theory and experiment, Dr. James Hoare has devised the first comprehensive mechanism for chromium plating. This increased understanding has helped electrochemists at the General Motors Research Laboratories develop a system that plates chromium sixty times faster than the conventional method, while improving energy-efficiency by a factor of three.

The electrolyte for plating is a chromic acid solution which contains various chromate ions: chromate, dichromate and trichromate. From a series of steady-state polarization experiments, Dr. Hoare concluded that trichromate is the ion important in chromium deposition.

Sulfuric acid has been recognized as essential to chromium plating and has been assumed by some to be a catalyst for the process. In this strongly acidic solution, sulfate should be mostly present as the bisulfate ion $(HSO_4)^-$. Dr. Hoare found, contrary to expectations, that the addition of sulfuric acid to the plating bath decreased the conductivity of the solution.

Combining these findings with the results of previous investigations, Dr. Hoare concluded that the electroactive species was a trichromate-bisulfate complex (see Figure 1). From equilibrium considerations, he theorized that the maximum concentration of this species occurred at a 100-to-1 chromic acid/sulfuric acid ratio. The observation that the maximum rate of chromium deposition also occurred at this ratio supports the conclusion that this trichromate-bisulfate complex is the electroactive species.

During the plating process, the complex diffuses from the bulk solution toward the cathode (see Figure 2). Electron transport takes place by quantum mechanical tunneling through the potential energy barrier of the Helmholtz double layer and the unprotected chromium in the complex (Cr atom



on the left in Figure 1) loses electons by successive steps, going from Cr^{+6} to Cr^{+2}. Decomposition of the resulting chromous dichromate complex takes place by acid hydrolysis to form a chromous-oxybisulfate complex:

$$^{+}Cr-O\leftrightarrow H\leftrightarrow O-\overset{\overset{O}{\|}}{\underset{\underset{O}{\|}}{S}}-O^{-}$$

The positive end of this complex is adsorbed onto the cathode surface. Electrons are transferred from the cathode to the adsorbed chromium ion, forming metallic chromium and regenerating the $(HSO_4)^-$ ion. Thus, Dr. Hoare's mechanism explains how sulfuric acid, in the form of the bisulfate ion, participates in the plating process.

IT HAS long been known that chromium cannot be plated from a solution when initially present as Cr^{+3} because of the formation of the stable aquo complex, $[Cr(H_2O)_6]^{+3}$. Yet chromium can be plated when initially present as Cr^{+6} even though it must pass through the Cr^{+3} state before being deposited. Dr. Hoare's mechanism handles this paradox by explaining that the chromium ion being deposited (on the left in Figure 1) is protected by the rest of the complex as it passes through the Cr^{+3} state, so that the stable aquo complex cannot form.

The diffusion of the electroactive complex apparently controls the rate of the process, so that shortening the diffusion path increases the speed of chromium deposition. A high rate of relative motion between the electrolyte and the cathode will shorten the path. This can be accomplished by rapid flow or by agitation of the electrolyte.

Dr. Hoare found that the rate of chromium deposition increased with electrolyte flow until the process was no longer diffusion-controlled. He also found that the use of dilute electrolyte significantly increased plating efficiency.

"This project is an excellent example," says Dr. Hoare, "of how basic research and engineering principles can be combined to develop a new, successful process. Now, we'd like to take on the challenge of plating successfully from Cr^{+3}, which would be an even more efficient way to provide corrosion and wear resistance."

General Motors

GM

MARK OF EXCELLENCE

THE MAN BEHIND THE WORK

Dr. James Hoare is a Research Fellow at the General Motors Research Laboratories. He is a member of the Electrochemistry Department.

Dr. Hoare served as an electronics technician in the U.S. Navy during the Second World War. In 1949, he received his Ph.D. in physical chemistry from the Catholic University of America. After an assistant professorship at Trinity College in Washington, D.C., he joined the US Naval Research Laboratory as a physical chemist. He became a staff member at General Motors in 1960.

Dr. Hoare's sustaining interest has been in electrochemical kinetics and the mechanisms of electrode processes. He is best known to the scientific community for his basic studies of hydrogen and oxygen electrode mechanisms. His book, *The Electrochemistry of Oxygen,* published in 1968, is considered a work of primary importance to the field. In addition to his work on chromium plating, he is responsible for the fundamental research that helped make electrochemical machining a precision process.

By Bennett Schiff

It took more than 200 years to get *this* work printed

Hidden from public view since Cook's first voyage around the world, Joseph Banks' treasure of art and science is being published whole

A proof is pulled from plate chromed to protect soft copper; a perfect proof can take weeks to produce.

It should come as no great surprise, considering what museums have and store, that now and then they might mislay something or other. It is not that they don't know what they have so much as that it is possible to forget a thing, here or there, for a moment or a century or two. We are, after all, talking of aggregates of wildly different objects in the millions.

In this case, what is being discussed is a bulky, ordinary-looking wood cabinet, an upended rectangular box standing casually between the Botany Library and the Main Herbarium of the British Museum (Natural History) in London. A little label, representing the quintessence of British understatement—in effect, being near to invisible—says: "Plates from Cook's First Voyage." In it is one of the world's great scientific and artistic treasures, 738 consummately accomplished, fine-line copper-engraved plates, each 12-by-18 inches and recording in impeccable detail botanical discoveries of that indelible exploration. The intention was, when they were completed some 200 years ago, to publish them. Now, after more than two centuries, they *are* being published. It is as though a great buried archaeological cache of art and science is being opened to the world.

The undertaking will have taken some 25 years to complete when done in 1987 and may very well represent the most ambitious, large-scale, fine-arts printing venture of modern or any other times.

Sydney Parkinson died on voyage; his sketch of *Banksia serrata*, or red honeysuckle, was finished in London.

James Cook's first voyage in his doughty, indestructible, tiny and lovable vessel, the bark H.M.S. *Endeavour*, lasted from 1768 to 1771. It was to become an expedition that caught the admiring fancy of the civilized world at a time when it was enjoying the pursuits and fruits of the Age of Reason—a landmark in history.

Even the mandate for the voyage was one to light a flame in the imagination, perhaps the most romantic charge to be given any expedition: to observe and chart the transit of Venus. This is one of those astronomical happenings not arranged for the convenience of Man. In 1639, a young English clergyman, Jeremiah Horrocks, had attempted, and failed, to plot the transit on a day during which the planet passes in a direct line between the sun and the Earth. A correct observation would have given the exact distance between the two, and would have afforded an invaluable aid to the science of the time.

There was a transit in 1761, and a second failed attempt. The next transit was to be in 1769, after which there would not be another until 1874. One of the best places to make the observation, it was decided,

Parham Manor, West Sussex

Banks (center), Solander and Omai, a Tahitian lionized in England, were painted by William Parry.

would be Tahiti, not that long before discovered by the English navigator Samuel Wallis. And so the *Endeavour* expedition was proposed by the Royal Society with the backing of the Admiralty and funding from King George III, a man who, never mind his standing in America at the time, was seriously interested in and supportive of scientific enterprise.

There is, as we know, a mathematical harmony of the spheres but, in order to observe it, you have to be able to see them. In the case of Venus, the trouble was its enveloping haze. So Cook's observation, too, was a failure.

Still, there were many things to do in that great watery part of the world. Cook had other orders as well: to go on from Tahiti in search of the elusive continent that men had for generations speculated was there, the mysterious Terra Australis Incognita, the Unknown Southern Land, the continent of Australia.

Cook's *Journals* describe the orders he was to carry out following the observation of the transit: "I was therefore ordered to proceed directly to Otaheite [Tahiti] and, after the astronomical observations should be completed, to prosecute the design of making discoveries in the South Pacific Ocean. . . ."

And he was instructed further: ". . . you are also carefully to observe the nature of the soil and the produce thereof; the animals and fowls that inhabit or frequent it; the fishes that are to be found in the rivers or upon the coast, and in what plenty . . . if you find any mines, minerals, or valuable stones, you are to bring home specimens of each, as also of the seeds of trees, shrubs, plants, fruits and grains peculiar to the country as you may be able to collect, and to transmit them to our Secretary that we may cause proper examination and experiments to be made of them. . . ."

Enter the remarkable Joseph Banks.

He was 25 at the time, already a member of the Royal Society over which he would later reign as president for 41 years, very rich, a respected botanist. He was healthy, strong, good-looking, outspoken and—if not overly sensitive—intelligent, stubborn and courageous. And he was charming as well. He could get things done. His income of about £6,000 a year, a great sum at a time when Samuel Johnson lived comfortably on the King's annual pension of £300, was very grand.

He was one of the few, if not the only one, to have gone to Harrow *and* Eton. He was an indifferent scholar but already intensely devoted to studying the natural world, botany in particular. When he should have been learning Greek and Latin he was, at 14, deep in the study of plants, comparing the old pages of Gerard's *Herball* with what he saw during his long collecting walks in the countryside.

Banks went on to Christ Church, Oxford, and from Oxford to Newfoundland and Labrador to do some first-rate collecting and classifying. When, upon his return, the *Endeavour* expedition came to his atten-

One of earliest known landscapes of Australia was drawn on Endeavour River and engraved in London.

tion, it seemed a gift from Heaven. Friends and family thought that such a voyage was entirely too dangerous and suggested, instead, the Grand Tour of the continent, which was the accustomed thing for young gentlemen of the time. His answer was typical: "Every blockhead," he said, "does that; my Grand Tour shall be one round the whole globe." It was.

In his style, when he arrived to board the *Endeavour*, he came with a party of eight and a great load of personal and scientific stores and equipment; this at a personal cost of about £10,000, which gives an idea of how he traveled.

A recent biographer writes that Banks had found "much the best salt beef" he had "ever tasted" in London's New Crane Street, beer from a dealer near St. Giles, porter from another at Wapping New Stairs. He had barrels of salted cabbage, and sheep, fowls and pigs. Also two greyhounds, for no Englishman would, if he could help it, go anywhere without a dog.

A letter from Royal Society fellow John Ellis to the great naturalist Carl Linnaeus in Sweden describes Banks' preparation: "No people ever went to sea better fitted out for the purpose of Natural History, nor more elegantly. They have got a fine library of Natural History; they have all sorts of machines for catching and preserving insects; all kinds of nets, trawls, drags and hooks for coral fishing; they have even a curious contrivance of a telescope, by which, put into the water, you can see the bottom to a great depth, where it is clear. They have many cases of bottles with ground stoppers, of several sizes, to preserve animals in spirits. They have the several sorts of salts to surround the seeds; and wax, both beeswax and that of *Myrica*. . . ."

The *Endeavour* is beached and a small boat sets out on a collecting, surveying and provisioning trip.

Great navigator and explorer Captain James Cook, as he was painted in 1776 by Nathaniel Dance.

Banks' party of eight included the ablest botanist in England, the Swedish scientist Daniel Carl Solander (opposite), a prize pupil of Linnaeus who had migrated to England; and a young botanical artist of genius, the gentle Quaker, Sydney Parkinson (p. 84), then 23.

The ship, which they shared with 86 officers, marines and seamen, was just 106 feet long and 29 feet, three inches maximum beam. There was not much room for turning around and they would be gone for three years. Dr. Johnson had a look at the *Endeavour* after her return and said that, rather than sail on her, he would have turned, with relief, to jail.

The route of the *Endeavour* was to Madeira, Rio de Janeiro, Tierra del Fuego, the Society Islands (including Tahiti), New Zealand, Australia, New Guinea, Java, the Cape, St. Helena and so home. There is no better exposition of what was entailed in the voyage that set the pattern for scientific expeditions to come (including that of Darwin in the *Beagle*) than in the Banks and Cook journals themselves, and in the luminous, enthralling introductions to and editing of them by the eminent New Zealand historian, J. C. Beaglehole, a fine and rare example of what scrupulous scholarship and witty, graceful writing can produce.

After more than 200 years, a flowering

Banks and Solander were indefatigable. Everywhere they went they collected, noted, observed. After a collecting venture in Tierra del Fuego, during which two of Banks' servants froze to death, he wrote in his journal: "Of plants here are many species and those truly the most extraordinary I can imagine. . . . But to speak of them botanically, probably no botanist has ever enjoyed more pleasure in the contemplation of his favourite persuit than Dr. Solander and myself among these plants; we have not yet examined many of them, but what we have turned out in general are so entirely different from any before described that we are never tired with wondering at the infinite variety of Creation, and admiring the infinite care with which providence has multiplied his productions. . . ."

Back on board with their specimens, the two botanists, Banks wrote, "sat till dark by the great table with our draughtsman opposite and showed him in what way to make his drawings, and ourselves made rapid descriptions of all the details of natural history while our specimens were still fresh."

Young Parkinson, who was to die of malaria at age 25 soon after the vessel left Batavia, Java, worked feverishly to record the finds, and it is clear now, from his finished drawings and those which he sketched along with specific notes as to coloration, that he was one of the outstanding botanical artists of all time. He had completed 269 of the nearly 950 drawings he had begun before he died. But his notes permitted five other artists in England to finish his work with the aid of the specimens which are still housed in the Main Herbarium of the British Museum.

Banks then further hired 18 masterful engravers to

Bennett Schiff, a member of SMITHSONIAN*'s Board of Editors, wrote on Monet's restored home, February 1980, and on the Post-Impressionists in June 1980.*

This spacious fine-arts printing studio was established specifically to print the *Florilegium*.

Master printer Edward Egerton-Williams oversees the studio; he went back to 17th-century techniques.

J. G. Studholme, copublisher of the *Florilegium*, with one completed section; there will be 34 in all.

Presses are at right; the studio is staffed by young artists with years to go before job is done.

make copperplates of the drawings. There are 738 of these in the British Museum's cabinet today and they are being published as *Banks' Florilegium*. As publisher J. G. Studholme (below) describes it, "They were engraved in pure line, the engraver working directly onto the polished copper with a sharp burin. Each shading of a stem, each fold of a leaf relies on the thickness and depth of the engraved line, the deeper channels carrying more ink and printing darker, the lighter areas achieved by shallower engraving."

At a time when the art of engraving was probably at its highest level in English history, Banks hired the best engravers there were. It cost him more than £7,000 just for the engravings, the equivalent today of about $500,000. Then, after 13 years of work, they were never published.

New to science: more than 1,400 species

Banks and Solander had brought back 3,607 species of plants with some 30,382 individual specimens, according to a recent detailed monograph by Banksian scholar H. B. Carter, and Judith A. Diment, C. J. Humphries and Alwyne Wheeler of the British Museum. Of that remarkable number, these experts estimate more than 1,400 species were entirely new to science at the time.

The reports of another expedition on which Banks and Solander were to go (they never did) caused Linnaeus to write to a friend in 1771: "I have just read, in some foreign newspapers, that our friend Solander intends to revisit those new countries, discovered by Mr. Banks and himself. . . . This report has affected me so much as almost entirely to deprive me of sleep. . . . Whilst the whole botanical world, like myself, has been looking for the most transcendent benefits to our science, from the unrivalled exertions of your countrymen, all their matchless and truly astonishing collection, such as has never been seen before, nor may ever be seen again, is to be put aside untouched, to be thrust into some corner, to become perhaps the prey of insects and of destruction. . . . By all that is great and good, I entreat you, who know so well the value of science, to do all that in you lies for the publication of these new acquisitions, that the learned world may not be deprived of them. . . . I confess it to be my most ardent wish to see this done before I die." Unfortunately he did not get his wish.

Banks continued to speak of publishing the engraved plates, but never did. He was too busy as president of the Royal Society, as the King's adviser on helping to make Kew Gardens the great botanical complex which it is today, and as a part of every scientific proposal, discovery and organization of the time. Also, the loss of the American colony had caused economic

After cleaning and chroming plate, color is applied using an old *poupée* or bunched-rag technique.

disruption to the wool trade from which Banks derived a substantial part of his income. Besides, his mansion at 32 Soho Square was open to all who were interested in his collections.

And although the plates and journals did not become prey to insects, as Linnaeus feared, they were "put aside untouched" and "thrust into some corner" (a safe one) for all these years.

The publication of *Banks' Florilegium*, now in process, will be accompanied by a definitive scientific catalog, to be published separately, relating the plant specimens to the drawings and the engravings with, in the words of the scholarly monograph: "some justice, long overdue, being so paid to those scientific pioneers, Banks and Solander. Whatever reservations systematists have about nomenclature and taxonomic priorities since 1771, there can be no doubt of the appropriateness in setting straight the record of the *Endeavour* collections. It is a fundamental requisite of history."

Some of the 738 plates are not entirely new to ink. Black impressions have been made over the years; the engravers themselves made proofs. Between 1900 and 1905, the museum made 331 photolithographic prints, and in 1973 a sampling of 30 prints was published in black under the misnomer, *Captain Cook's Florilegium*. It was published by the Royal College of Art in conjunction with the British Museum; a copy of this book, which originally cost 150 guineas, was sold at auction for £3,529 in 1981. Now all 738 plates are being published in color for the first time, born after a gestation of more than 200 years.

Studholme talked about this great publishing venture in his London headquarters, a masterfully converted former factory for nonalcoholic communion wine. He had become aware of the engraved plates in 1963 when the Royal Academy of Art was setting out to publish the 30 prints in an edition of 100, a job which would take a decade to complete. He and some colleagues and friends from Oxford and Cambridge had recently set up their fine-prints company, Alecto, named for one of the Greek furies—"an extremely disagreeable person," he says. They bid for the job and were politely shown the door.

Editions Alecto Limited is also publisher of prints by John Piper, David Hockney, Eduardo Paolozzi and William Scott, among outstanding British artists, and by the Americans Jim Dine, Claes Oldenburg, George Segal, Edward Ruscha and Robert Graham. When, in 1978, the museum began to think of a complete edition, Alecto came to mind.

A 28-year-old artist and master printer, Edward Egerton-Williams (p. 80), who was then an Alecto employee and a perfectionist of great patience and dedication, set up his own shop to print the *Florilegium*. Egerton-Williams had the inspiration to go back to a 17th-century technique invented by Dutch artist Johannes Tayler called *à la poupée*, in which a bunched piece of cloth, or "dolly" (*poupée*), was used to work each color directly into the plate with, in this case, as many as 15 colors.

Today, young artists printing the *Florilegium* work with as much care and artistry as any monk in a medieval scriptorium. It can be a maddening job.

The fine and tedious job of printing

To begin with, the plates were still wrapped in the original layers of acid-laden, 18th-century paper which had eaten minute pockmarks into the soft copper. On top of this, the black ink used for early proofs had hardened deep into the incised lines to the consistency of stone. The process of printing the plates begins with cleaning the surface with small burnishers and jewelers' rouge. Then chemical washes are applied to break down and float out the hardened ink. The surface is then chromed for protection.

The plates are now ready for inking in color (above), an immensely subtle and complicated procedure since prints must be precisely true to Parkinson's original colors and to the scientific accuracy of each plant reproduced. Parkinson's notes on the backs of his drawings are carefully taken in; there are many talks with botanist Chris Humphries at the museum, who knows the originals of each plant. To achieve a perfect proof takes from a week to two months. Then, the inked plate is put into the press bed; especially-made, dampened Somerset paper is laid on top; both are cov-

Thunderbird for '83. Before we made it beautiful, we made it right.

From the slope of its hood to the flip of its tail, Thunderbird is obviously aerodynamic. It uses the air to press down on the front end for directional control.

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Get it together–
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HAVE YOU DRIVEN A FORD... LATELY?

Sydney Parkinson made artistic record of botanical finds; four from Australia are shown on opposite page.

ered with felt press blankets; and the copperplate rolling press is turned by hand, the roller pressure of a ton or more forcing the damp paper onto the incised lines.

After each impression, the plate is taken from the press, cleaned and inked all over again. This must be repeated 110 times for each of the plates and suggests why it is taking so many years to produce the work. The prints are dried flat between sheets of blotting paper under heavy weights for six days, before being mounted and placed in boxes designed by Solander in the 18th century and still much the best way of protecting a fine print. Each print is blind-embossed with the printer's and publisher's "chops" (marks), along with information on the individual engraver and artist. The Solander boxes measure 31 by 24 by two-and-three-quarters inches deep. The first portfolio of Australian prints weighed 45 pounds in all. "Instant hernia for any librarian," says Studholme.

There are to be 34 parts when the project is completed in 1987, most containing 22 or 23 of the prints. The total subscription price is £55,000, or about $90,000. The Australian plants (opposite), consisting of 337 plates, make up Parts 1 through 15; there are then sections, in varying numbers, for Brazil, Java, Madeira, New Zealand, the Society Islands and Tierra del Fuego—34 boxes in all. An edition of 110 will be printed, 100 of which are for sale. There has not been a shortage of subscribers; already the majority has been sold.

An exhibition of prints from *Banks' Florilegium*—"A Flowering of Science: Plants from Captain Cook's First Voyage, 1768-1771"—may be seen at the American Museum of Natural History in New York from April 26-July 8, and later in various locations around the country under auspices of the Smithsonian Institution Traveling Exhibition Service (SITES).

In London, the British Museum, which is the copublisher with Studholme of this work, has guaranteed that there will not be another printing from the plates for at least 50 years. Not to worry. "It's inconceivable," says Studholme, "that anyone would be willing to go through this torture again. I'm aware of the number of corpses strewn throughout history of publishers who've attempted special projects."

It is possible for some scholars to go to the British Museum today, to walk into the Main Herbarium and to see there row upon row of handsome mahogany cabinets, especially built for Banks to hold his collections. Stacked five high, they rise to a height of just over 11 feet, whole corridors of them, the Banks' Herbarium, one of the continuing wonders of the world of natural history and science. You can take the same plant from one of these cases that Banks himself plucked out of the earth in Australia, where no outsider had been before, carry it to his *Journal*, look up the day, more than two centuries ago, on which he examined it and read his description in his own hand, go to Parkinson's watercolor drawing of it and feel your skin prickle. Then you can go to the printing studio and hold a freshly, perfectly printed engraving in your hands of that same plant, a piece of, for the first time, *Banks' Florilegium*.

Yes, *Banks' Florilegium* now lives, a part of the stock of Western civilization, a permanent flowering.

Dillenia alata, or guinea flower.

Vandasia retusa, in the pea family.

Buchanania arborescens, in sumac family.

Cochlospermum gillivraei, or Kapok bush.

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June ~~23~~ 26, 1982

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~~The sample we sent you to copy happened to have a small cigarette~~ burn in the right sleeve. Do you realize, Mush-for-Brains, that you sent us over 2,000 jackets with that burn precisely duplicated on every single right sleeve?

~~And whoever heard of~~ Nehru jackets with lapels? ~~It'll be a cold day in Calcutta, Mush-for-Brains, before we pay you one red cent.~~

Sincerely,

Brian O'Neill
Vice President of Sales

one 'm' or two?

I regret to inform you that the lot entire was found defective

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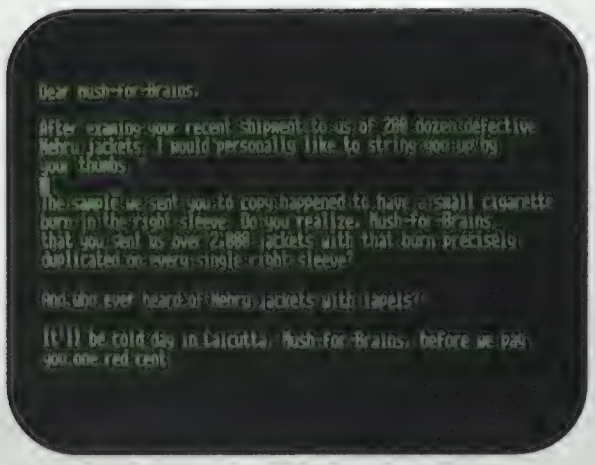
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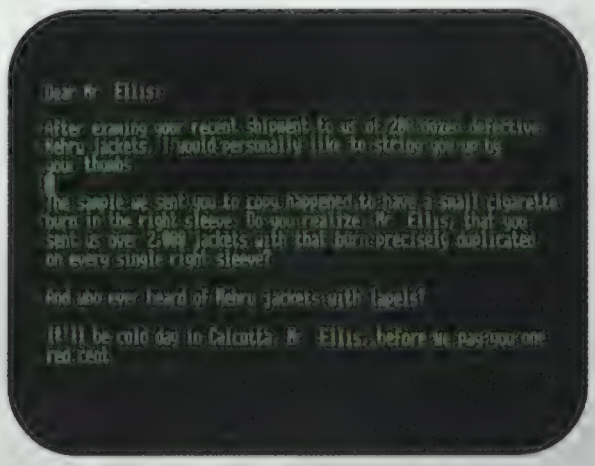
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The sample we sent you to copy happened to have a small cigarette burn in the right sleeve. Do you realize, Mr. Ellis, that you sent us over 2,000 jackets with that burn precisely duplicated on every single right sleeve?
And who ever heard of Nehru jackets with lapels?
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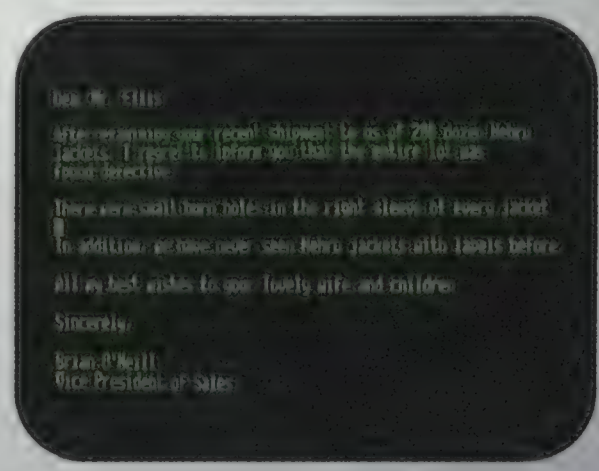
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After examining your recent shipment to us of 200 dozen Nehru jackets, I regret to inform you that the entire lot was found defective.
There were small burn holes in the right sleeve of every jacket.
In addition, we have never seen Nehru jackets with lapels before.
All my best wishes to your lovely wife and children.
Sincerely,
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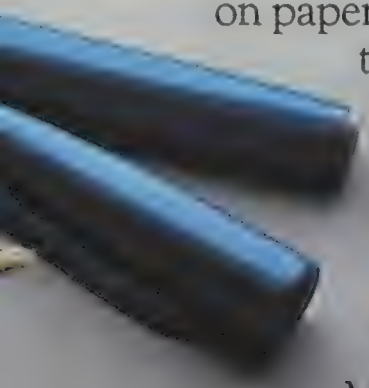

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By Jim Doherty

A legend still lives as sled dogs race across the snows

Sinewy long-distance runners once helped Man to survive the rigors of the far North; now they compete from New Hampshire to Alaska

Statue in New York's Central Park honors Balto and the dramatic rushing of serum to Nome, Alaska.

It was 38 below in Hibbing, Minnesota, when the sun kindled a purple fire behind the snowy ore dumps that rise up like foothills on the east side of town. Out at the fairgrounds, a cavalcade of pickup trucks was already rolling past a striped carnival tent and into a fenced-off enclosure where, soon, a great clamor arose. Huffing and puffing in the ferocious cold, dozens of men and women removed from their trucks hundreds of excited dogs which commenced to yelp, whine, clank their chains and lap steaming water out of clattering metal pans. While bundled-up onlookers waddled about in the confusion, taking care to watch where they stepped, the dogs were hustled into harnesses, attached to sleds and lined up. "Are you *ready*, team?" the frosty lead driver bellowed at her lunging chargers. "Go!" shouted the starter and, with that, the Hibbing International Sled Dog Races were under way.

Many people think that ever since the snowmobile revolutionized travel in the North Country two decades ago, the dog sled and the legendary huskies that pulled it have been teetering on the brink of extinction. As it happens, however, many people are wrong. Eskimos and Indians no longer rely on dog sleds as their principal means of transportation in the winter. The Royal Canadian Mounted Police have not sent out an official dog patrol since 1969. But as events in Hibbing and elsewhere make abundantly clear, dog sledding seems to be in the midst of a revival these days. The main reason is the booming popularity of a heretofore unheralded sport: sled-dog racing.

A decade ago, there were only a couple of dozen top professional "mushers," as sled-dog racers call themselves, in the entire United States. Today the International Sled Dog Racing Association (ISDRA) in Nordman, Idaho, lists some 3,000 members worldwide —a sixfold increase in the past five years—and sanctions more than 60 annual events. Another several thousand hobby racers participate in numerous meets each year. The professional racing circuit spans North America's snowy regions from Laconia, New Hampshire, to Truckee, California, and on up into Alaska and Canada. The competition ranges from a festive two-day affair in Ely, Minnesota, which attracts thousands of spectators, to the punishing Iditarod International Sled Dog Race in Alaska, a 1,000-mile marathon that can take at least two weeks to complete. "Racing has been a big drawing card in Alaska for years," says Dave Walling, a musher from Idaho. "We haven't achieved that kind of visibility down here yet, but we're moving in the right direction."

At 19, Doug McRae of Rhinelander, Wisconsin, is one of the youngest medal winners on the racing circuit.

Fourteen dogs, spread out in a traditional fan, pull Eskimo sled across the snows of Greenland.

Fundamentally, sled-dog racing is more than a contest and more than an entertaining spectacle. It is a souvenir of the time when Eskimos and other inhabitants of the Far North valued dogs not only as transportation but as an aid to survival. Modern sled-dog racing is not as desperate as all that, of course. But it does utilize essentially the same equipment in the same way and it depends on the same extraordinary bond between driver and team. Most of all, though, it depends on the magnificent heart, steely muscles and indomitable spirit of the dog that loves to run for miles across the snow.

Over the years, the most familiar sled dog has been the classic Siberian Husky, with its wolflike head, thick shoulders and distinctively curled-up tail. The typical racer today, though it is called an Alaskan husky, is apt to be surprisingly unprepossessing, crossbred, part husky, part hound, part some other kind of dog. Some

of the huskies are "village dogs," so named because they come from dozens of native hamlets scattered throughout the 49th state and northern Canada. A racing dog weighs 45 to 50 pounds, stands a couple of feet tall at the shoulder, has a deep chest and high, sinewy haunches. At rest, it behaves pretty much like any other dog. In the harness, it is transformed into a churning dynamo of truly astonishing power. When a team of these exuberant beasts surges eagerly up to

Helmer Hanssen stands at South Pole in 1911 with his faithful dog team. Some had to be killed for food.

the starting line, six or eight beefy men have all they can do to hold them in place for the final countdown.

While Alaskan huskies dominate the racing scene, many first-time visitors at a sled meet are surprised to find a variety of decidedly unhuskyish canines in the traces—everything from coonhounds and collies to Irish Setters and Dalmatians. These and other unlikely breeds can turn out to be terrific racers. As a rule, however, they are not as competitive as the huskies, nor as durable as the chunky Siberians. The difference is that the hardy "northern" dogs have been bred for centuries specifically to work on the trail. For them, sledding is as natural, not to say downright joyful, an exercise as field trials and hunting are for retrievers and pointers. "Their instinct to pull is strong," observes author and musher Lorna Coppinger in her book, *The World of Sled Dogs*. "More than one owner of a northern dog has been amazed, on hitching his dog to a child's sled, to see his pet put his head down and pull, just as though he were a veteran team dog."

Historians can only guess how long dogs have been pulling sleds. It seems likely that the earliest Eskimo pioneers brought dogs and sleds with them to this continent from Asia. Over the centuries, the descendants of those creatures were bred into burly brutes able to perform tremendous labors.

A frequent contributor to SMITHSONIAN, *Jim Doherty has written about Buffalo Bill, the Great Seal of the United States and the annual duck-stamp art bonanza.*

Eager to race, sled dogs pull at their harness. It can take several men to restrain them at the starting line.

In the summer, the native dogs were used as pack animals on hunting trips. In the winter, they hauled transport sledges and helped their nomadic masters locate seals and bring polar bears and musk oxen to bay. The dogs were at first so essential for travel and guard duty, later for hunting and tending trap lines, that occasional epidemics of what is believed to be distemper among them caused distress in Eskimo villages from Alaska to Greenland. A family without dogs was in for a rough time. An effective way to avenge an insult was to kill one or two of the offending party's dogs.

For a while, Eskimos managed to get by without trained lead dogs, but it was hard work. They hitched the dogs to the sled in a "fan-shaped" arrangement (later tandem-style) and did the leading themselves. They began teaching voice commands to a smart, fast, tough dog positioned at the head of the team. That enabled the drivers to ride along on the sled, giving orders. Because of their special role, the lead dogs were often given preferential treatment.

The Eskimos' renowned ingenuity was clearly evident in the manufacture of their sleds. Trees being scarce in the Far North, the sleds had to be built of whatever was available—driftwood, bones, even ivory. Occasionally, the runners were made of lengths of hide soaked in water, bent up at one end and frozen solid. Runners were usually surfaced with strips of ivory or bone and frozen mud and water were sometimes smeared on top of that to obtain a contact surface of smooth ice.

The sled components were bound with hide, which was also used, in thicker strips, to fashion the dog traces and harnesses. To prevent dogs from chewing the lines to bits, some Eskimos dulled their sharp teeth with a stone. But that created another problem: the animals couldn't chew their tough meat, and so it had to be cut up into small pieces for them.

For all the ties that bound the Eskimos to their dogs, they regarded the creatures in a curiously ambivalent way. Dogs were valued by their owners as property and passed on as an inheritance. In the summer, when the living was relatively easy, the dogs could be left to fend entirely for themselves on scraps of garbage and whatever wild game they were able to procure. Despite this seeming callousness, the Arctic adventurer Peter Freuchen insisted that an Eskimo's dog team was "his pride and glory."

Around the turn of the century, a new generation of determined polar explorers—the Norwegians Fridtjof Nansen and Roald Amundsen, the Americans Frederick Cook and Robert Peary, and others—took a cue from the Eskimos and used dog sleds on their perilous expeditions. Dogs were absolutely essential to the spectacular achievements of Amundsen, who beat England's valiant Robert Falcon Scott in their famous race to the South Pole in 1911, and of Peary, a naval officer who reached the North Pole in 1909. The lack of dogs was responsible for the failure of expeditions which relied mainly on ponies and manpower, notably Scott's. Only Eskimo huskies were tough enough, it turned out, to withstand the fierce weather and haul ponderous sledges across hundreds of miles of snowfields, ice ridges and treacherous fissures.

Jim Harvey's open-class (no limit) team rounds a bend during 16-mile race in Hibbing, Minnesota.

But, although they were indispensable, the half-wild animals were not exactly lovable. Noisy, messy, frequently balky and often downright vicious, the dogs employed by Amundsen and Peary seemed to be forever fighting, tangling themselves in their traces or raiding the pantry. The Eskimos who accompanied Peary's party were superb dog handlers, of course, but the animals often confounded the inexperienced Americans. Hitched up in teams of eight—sometimes ten or 12—per sledge, the creatures were forced to drag 500 pounds of provisions 15 or more miles a day. "Sticks, snowshoes and the flat side of hatchets had to be used on the dogs," George Borup, one of Peary's men, reported after a typically brutal day. The animals suffered stress fractures, muscle strains, ripped feet, exposure, thirst and exhaustion. Some got sick, went mad and died. The ravenous survivors subsisted on a meager daily diet of about a pound of pemmican, concocted of dried meat and fat. At night, they were left out in savage winds and temperatures that dropped below —50 degrees F, freezing them fast in the snow.

Such hardships were lamentable but necessary, in the explorers' view. Years later, however, some of the adventurers were still bothered by memories of the trials their dogs had endured. "They had to be driven hard and whipped if we were ever to get there in fact," insisted Helmer Hanssen, one of Amundsen's men. "If there is any truth in the doctrine of transmigration of souls," he added somewhat sheepishly, "I sincerely hope my next incarnation will not take the form of a dog on a polar expedition."

A team gets off to a flying start in an open-class race. Note differences in the dogs' physical types.

A husky sits out a race in the cab of a truck. Dogs are usually kept in boxes in back or staked outside.

Hanssen had a special reason for making that wish. The flinty Amundsen regarded his dogs as both beasts of burden and a practical source of meat. After using 48 of his animals to surmount an enormous glacier, Amundsen and his men methodically shot and butchered more than half of them. The next day, they treated themselves to dog cutlets. "It was excellent," Amundsen enthused, ". . . perfectly delicious."

Long before these polar adventures it was well understood that dogs were the camels of the Northland. Settlers employed them for such tasks as long-distance mail delivery and freight transportation. And when thousands of prospectors thronged into the Yukon in the 1890s, a good dog was suddenly worth its weight in gold.

By the turn of the century, the lore of the sled dog was firmly established. The Canadian poet Robert Service inscribed a paean to his. Then, in 1903, the American novelist Jack London published *The Call of the Wild,* his vivid saga about Buck, a California superdog shanghaied into servitude in the Yukon. A compelling blend of gory realism and romantic anthropomorphism, the enormously popular book elevated the sled dog to a beast of mythical proportions.

No challenge was too great for Buck—not even hauling a half-ton sled 100 yards to win a bet for his beloved master, John Thornton. "Buck threw himself forward, tightening the traces with a jarring lunge. His whole body was gathered compactly together in the tremendous effort, the muscles writhing and knotting like live things under the silky fur. His great chest was low to the ground, his head forward and down, while

Sled dogs still race on northern snows

his feet were flying like mad, the claws scarring the hard-packed snow in parallel grooves." After the mighty deed was done, a fellow musher offered Thornton, who was overcome with emotion, $1,200 for Buck. When Thornton replied, with tears streaming down his cheeks, "You can go to hell, sir," dog lovers around the world rejoiced.

In the interminable Northland winters, with time and money on their hands, the sourdoughs began racing their teams. The first big meet was organized in 1908. Called the All-Alaska Sweepstakes, it was a grueling 408-mile round trip out of Nome that became a celebrated annual affair.

Liver is mixed with water to entice dogs to replace fluids lost racing. Socks protect pads of the dog on left.

The planners of that race did not position the contesting teams head-to-head in the manner of horse racing. Instead, the complements of from ten to 20 dogs started at staggered intervals and ran against the clock. The winner was the team with the best elapsed time. This same basic format is still used today.

Sled-dog racing grew steadily in the southern snow belt even as it mushroomed into Alaska's state sport, and, from the beginning, there were heroes aplenty—both men and canines. Over the years, some of the top racers' magnificent lead dogs proved themselves to be every bit as resourceful as Jack London's fictitious Buck. One of them, a floppy-eared dog named Baldy, was a favorite of Scotty Allan, an intrepid Alaskan driver. Known as "the King of the Arctic Trails," Allan was unceremoniously dethroned in Baldy's first big race as a lone lead dog when he hit his head on a trail marker and tumbled off the sled. Baldy kept right on going before realizing something was amiss. He then turned the team around, raced back to the unconscious Allan and revived him. Allan climbed back onto the runners and Baldy "started off on the jump." The groggy Allan, spattered blood frozen on his white parka, realized they were going the wrong way. He turned the team around, and eventually won the race.

Did the wrong dog get the glory?

One of the most celebrated lead dogs of all, though, was the great Leonhard Seppala's Balto. Seppala, a Scandinavian immigrant, was known throughout Alaska as a superb handler of dogs but he gained international renown on the storied "serum race to Nome" in 1925. That winter, it appeared the snowbound city had been struck by a potentially disastrous epidemic of diphtheria. Seppala was selected to travel south from Nome by sled toward Nulato to obtain a life-saving supply of antitoxin. Balto had been considered nothing more than a "scrub dog" and had been consigned to a slow work team. Seppala decided to hook up his best lead dog, named Togo, for the urgent mission.

After four days and 170 miles of brutal sledding, Seppala picked up the serum from a relay team and headed back. A day later, he handed over the precious package to another driver and team. Ironically, the lead dog on the team which battled the final miles through a storm to Nome was none other than Balto, who had been borrowed from Seppala's kennel to spearhead the final thrust. Thus, although poor Togo did most of the work, it was Balto, the finisher, who ended up getting most of the glory. A lifelike statue of Balto is situated in, of all places, New York City's Central Park (p. 89).

No champion musher dominated the sport longer than Dr. Roland Lombard of Massachusetts. The

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Curled head to tail, a dog keeps warm in snow. Explorers left them outside even at —50 degrees F.

sinewy veterinarian started winning races decades ago, and he's still at it today. In recent years, George Attla, an Athapaskan Indian from a tiny village near the Arctic Circle, has been the hottest driver on the circuit, winning the coveted Anchorage Fur Rendezvous' World Championship Sled Dog Race ten times. But lately even the mighty Attla has been sorely pressed to keep up with a dozen challengers. "The time when one or two drivers could dominate the field is gone forever," says Terry Martin, a tall, soft-spoken rancher and musher from Idaho. "The competition is just too goldanged tough."

Sled-dog racing is not the kind of thing that occupied the Eskimos' time, but the sport does carry over a good many Eskimo themes and much of the paraphernalia. The harnesses and tow lines are fabricated of nylon but the principle remains basically the same. Like the Eskimos, mushers keep their animals outside all year: in kennels or—when they're on the road—in dormitory-like boxes on the backs of their trucks.

Mushers also run their dogs in a time-honored way, without using reins or any other direct controls, except a foot brake and a snow hook that can be thrown out like an anchor to help keep the sled "parked." The drivers' basic command words are "gee!" for right and "haw!" for left. To urge the animals on toward the end of a race, they often exclaim, "Let's go home!" The mushers do *not* say "mush" to their animals. The term apparently derives from a mishearing of the French "*Marche!*" which means "go."

A while ago, the average speed of a good sled-dog team was 14 or 15 miles an hour. Today, many dogs can manage 20 miles per hour, and two years ago a five-dog team of hounds owned by Colorado musher Dan Larkin ran as fast as 20.9 miles per hour at Ely. Larkin won that race but, amazingly, the runnerup was only two seconds behind him.

The dogs are running so much faster partly because they eat better than their predecessors and get more exercise, but also because they are being bred differently. Breeding has always been an important part of sled-dog racing, but many of the old-timers went about it in a hit-or-miss fashion and they emphasized strength, endurance and bulk.

As the popularity of sled-dog racing increased, the competition got tougher and mushers began to crossbreed their dogs with greyhounds, Labradors and numerous other types of dogs, going more and more for speed. Accordingly, the animals got smaller, leaner and more high-strung. The dominant type today, the Alaskan husky bred by Eskimos, Indians and white breeders, reflects this. Rarely does a dog on a top racing team exceed 60 pounds and many weigh a good deal less. Although the huskies tend to duplicate the classic features of their forebears, many of them have a decidedly houndish aspect and rarely do two animals on a team of huskies look alike.

That kind of diversity, however, can be misleading. Many mushers with anywhere from 30 to more than 100 dogs maintain careful pedigree records which help them to control their breeding scientifically. Terry Martin can trace many of his 80 or 90 Alaskan huskies back four or five generations on both sides. "It's just like breeding quarter horses," he says. "When you can prove your lines and you know what they produce, you can keep on tightening up your gene pool to get the speed and competitive attitude you want."

Drivers delight in disagreeing over dogs

Mushers love to argue about their dogs. Many drivers believe the statuesque Siberian Husky, once a mainstay of racing, is too slow to keep up with today's dogs. Owners of Siberians do not agree. Hounds are said to be good for shorter distances but supposedly lack staying power. Malamutes are reputed to be surly. "They'll eat your team," growls one Alaskan husky owner, adding: "The only good malamute I ever saw was about three days dead."

It's a good thing sled dogs love to run because they do an awful lot of it. Their regimen begins when the temperature drops: the creatures are hitched in teams to carts and run for miles on dirt roads, and it continues well into the snow season with sleds. The Eskimos merely harnessed up their dogs after the first snow and took off. The result: pulled tendons, stiff joints and exhaustion. Today, most drivers believe conditioning is as important as breeding and nutrition. It's es-

sential exercise for the mushers, too, because racing can be as tough on them as it is on their dogs.

Winning races has mainly to do with what some mushers call "coach's pride." Like any other coach, the musher evaluates talent, assembles a team, trains it, observes the strengths and weaknesses of his players. He might position his strongest pullers closest to the sled and put his most reliable ones out in front. Then he runs his team several miles, perhaps every other day, perhaps more or less than that, for months, finding out which individuals have to be pushed and which ones require pampering. He learns how to read his animals when they are running—how to tell, just by observing the attitude of their ears, heads and tails, when a dog is loafing, resting, hurting or coming apart under pressure. He learns how to talk to the creatures and teaches them how to listen. After all that, when the coach finally plays his team in a real race, anything less than a victory is very likely to be received as a profound disappointment.

Official meets are thoroughly monitored by race officials not only to make sure the dogs aren't mistreated but to uphold the frail etiquette of the track, as well. In earlier times, when female racers were still a rarity, the men might be counted upon to help a damsel in distress. In today's highly charged atmosphere, it's a different story. Val McCracken, of Ely, is a top three- and five-dog driver. After a Colorado man's dogs twice tangled with hers last year, she took to wearing a big knife on race days. "If it happens again," she vowed, "I'll cut his dogs off his sled."

Modern-day sled dogs still lead a rugged life, but the mushers insist that their animals are much better off than the vast majority of household pets. Like the Eskimos of old, some drivers are inclined to think of their dogs primarily as property, but many regard them with affection. "They're so sensitive and smart that you just can't be heavy-handed with them," says Elaine Martin, Terry's wife and a driver herself. "You've got to treat them like a class of second- or third-grade youngsters." Recently, Merv Hilpipre, a 48-year-old auctioneer from Iowa, had to sell his top team. "I have been crying ever since," he says earnestly. "I get so *attached* to these animals."

A well-shod driver pushes on sled to help his three-dog team charge up a slope during a race in Minnesota.

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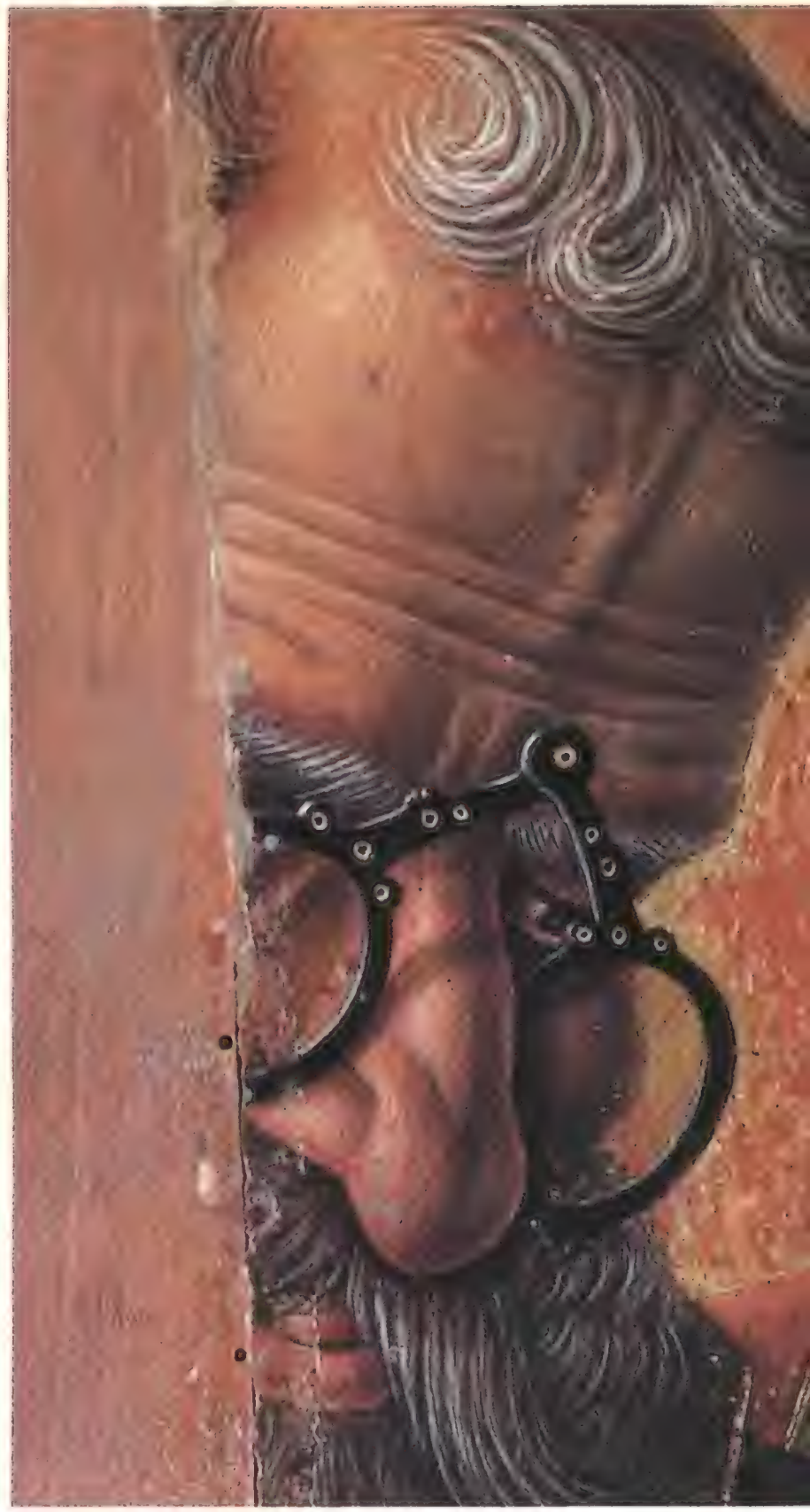
Clockwise from front: Chinese wood frames (1700), lunettes (1900), "temple" glasses (1850), tortoiseshells (1800), lorgnette (1900); at the center, pince-nez.

By Dora Jane Hamblin

What a spectacle! Eyeglasses, and how they evolved

Nobody knows who invented them, and it took centuries to learn just how to keep them on, but unglamorous specs are now chic as can be

Accademia, Venice

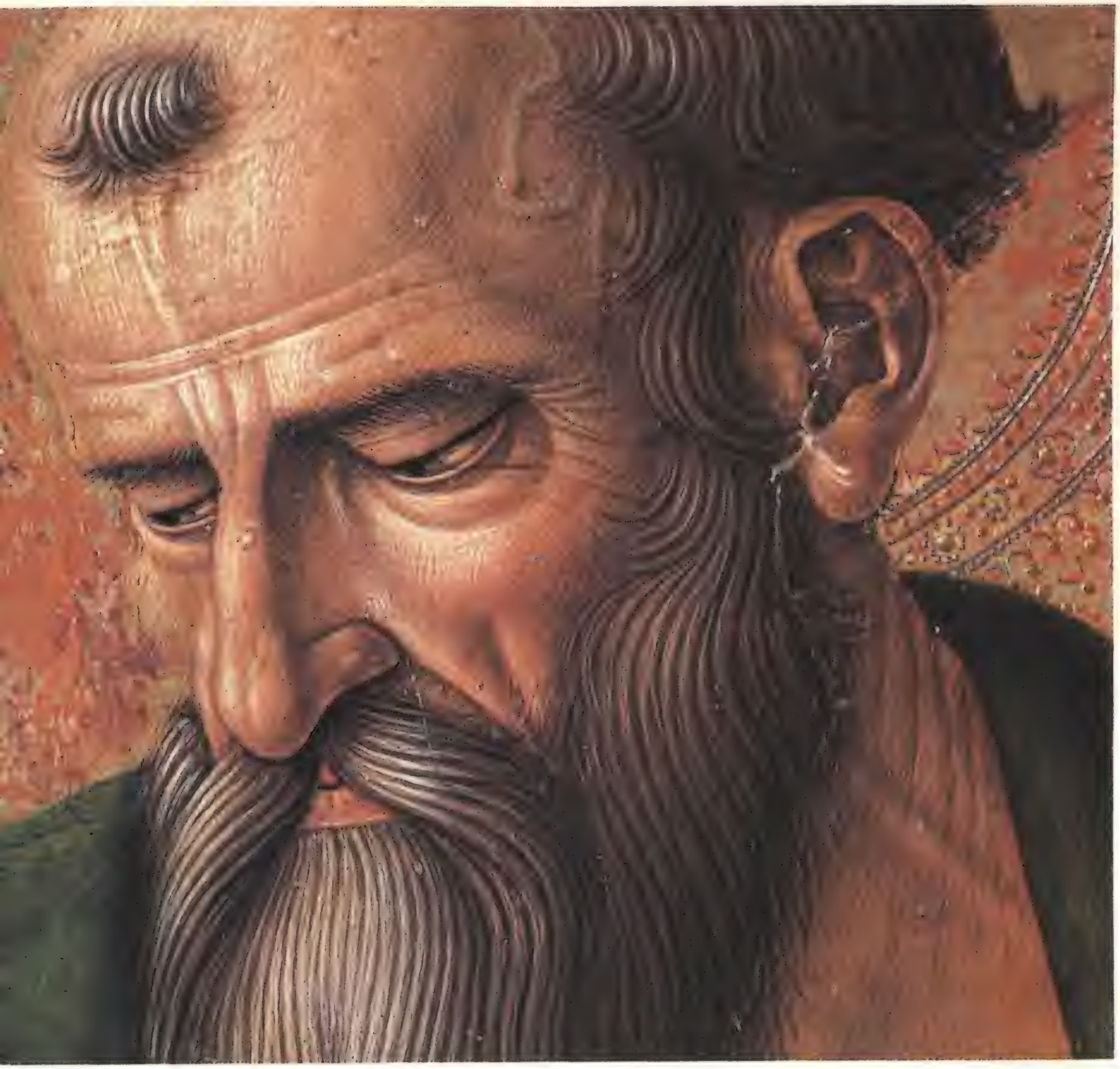


Bespectacled St. Peter (left) confers with St. Paul in this detail from an anachronistic painting by Carlo

A Spanish viceroy of Naples in the 17th century wore them daringly in public. English fops about 1805 wore only one and called it a "quizzer." The first person to be painted wearing them was a Dominican brother of the 13th century. Orientals loved them but found they wouldn't stay on. A character in Oliver Goldsmith's *Vicar of Wakefield* traded his horse for a gross of them, and one of the first to sell them in Philadelphia, in 1783, advertised "a bushel basketfull."

The objects in question are eyeglasses, reading glasses, that common, everyday boon to millions whose arms have grown too short or whose light bulbs too dim to make out fine print in the phone directory, stock-market quotations or other people's calligraphy.

Whoever invented them deserves a medal, a statue, a commemorative stamp, but nobody knows who he was. In more than a century of digging around in ancient archives, researchers have come up with many dizzy, dazzling examples of the spectacle-maker's art, but have yet to find their man. What they have found is that once spectacles were invented, they wove themselves deep into the social history of the West, becoming part of the folklore, the fads and foibles, of each nation. It was the English, despite everybody's clear image of actor Erich von Stroheim wearing one, who invented and popularized the monocle. It was the



Crivelli. Since churchmen did most of the world's pre-Gutenberg reading, early eyeglasses were a symbol of wisdom and painters sometimes plunked them retrospectively on august subjects as a sign of respect.

Spanish who first figured out how to secure glasses behind the ears with loops. And centuries before Dorothy Parker proclaimed that "Men seldom make passes at girls who wear glasses," the French had arrived at the same conclusion and used their reading aids only on the sly. Italians worked out the first primitive codification for lens strengths. It was America's ubiquitous Ben Franklin who invented bifocals in the 18th century, and it was in Switzerland, at the turn of this century, that contact lenses first saw the light of day.

Glass itself, the substance most commonly associated with glasses, was known and worked by 2500 B.C. and many early peoples knew something about optics. Two rock-crystal magnifying lenses dating from 1200 B.C. have been found in Crete, and the Greek playwright Aristophanes mentions a crystal lens in a comic scene in *The Clouds*. The Roman tragedian Seneca, born in about 4 B.C., is alleged to have read "all the books in Rome" by peering at them through a glass globe of water to produce magnification. But he couldn't balance the globe on his nose.

An 11th-century Arabic scholar known in English as Alhazen wrote a voluminous work on optics that was translated into Latin in time to be studied by Roger Bacon, the great 13th-century Oxford scholar. Bacon is sometimes credited with the invention of eyeglasses,

Museo Stibbert, Florence

Early pince-nez helps Marinus van Reymerswaele's "usurer" keep books in 16th-century Flemish painting.

and he certainly knew that a planoconvex lens would make letters appear larger and easier to read. But he didn't invent spectacles.

Their inventor must have been waiting in the wings at about that very same time, however, for in the late 13th century the plot suddenly thickens. The archives in the Abbey of Saint-Bavon-le-Grand in France have references to a priest named Nicolas Bullet who used spectacles to sign an agreement in 1282. German medieval poets mentioned optical magnification in works written between 1260 and 1284. Marco Polo threw everything into confusion around 1295 with a report, no doubt apocryphal, that he had seen snakes wearing spectacles in India. These turned out, however, to be cobras with eyeglasslike markings (p.110).

Something clearly had happened, and a few scholars will go as far as to say it was "1268" or "1280" when that first somebody got the brilliant idea of attaching two lenses together and perching them on the human nose conveniently close to the eyes. The trail leads most convincingly to Italy, and specifically to Venice.

Dora Jane Hamblin lives in Italy and writes frequently for SMITHSONIAN. *Her most recent article dealt with art treasures of the Vatican.*

Venetian glass was famous in the medieval world. City archives of 1300 mention the art of making spectacle lenses and magnifiers, and a notice, made June 14, 1301, specifically concedes the right of making glass objects for reading to any person who belongs to "the art of crystal workers." In March 1317, members of the ruling *signoria* awarded to one Francesco, son of Maestro Nicolò the surgeon, permission to make and sell spectacles of glass despite the fact that Francesco was not a member of the crystal-workers guild.

The first recorded public reference to what was surely one of the most important inventions of the age came in the church of Santa Maria Novella in Florence in 1306. The speaker was a Dominican brother named Giordano da Rivalto (perhaps a Tuscan corruption of the Rialto, in Venice), who told worshippers: "It is not yet 20 years since someone found the art of making glasses which enable one to see well. . . ." Brother Giordano clearly spoke from the heart because he added that he could with their aid "see persons who before I found only by hearing them."

In the 11th-century church of Santa Maria Maggiore in Florence, tucked away behind a side altar, is a marble plaque dedicated to "the inventor of eyeglasses," one Salvino d'Armato degli Armati, who died in 1317. But the memorial wasn't installed until the 19th century and no further credentials exist. So the honor of inventing spectacles must still rest with some nameless artisan, perhaps one of the hundreds of Venetians who turned out the small biconvex panes of quartz or glass routinely set into mountings for the leaded windows of Venetian churches and palaces. One

Venetian models, with leather rims, were found on a 16th-century Adriatic shipwreck in 1967.

WINE & FOOD

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Seminario Vescovile, Treviso

First known picture to show spectacles—Cardinal Hugh of Provence, painted by Tommaso da Modena.

of them, one day, must have squinted through a lens, picked up a second with his other hand and lifted it to his other eye, proclaimed something like "Eureka" or "Mamma mia," and decided to fasten the two together and perch them on his nose.

It is significant that almost all the early references to glasses, and the first paintings of them, involve churchmen. For before the invention of the printing press in the 15th century few ordinary citizens could read. Writing and study were mainly pursued in monasteries and only there did men with bad eyesight or advancing years need help. Long before they had lenses attached to their faces, they read with the help of magnifying glasses that could be laid flat on manuscripts or mounted on small stands. At first it took a certain amount of courage to adopt the new invention, because many philosophers of the time considered *any* tampering with nature to be a sin. It was impossible, such thinkers held, to see the true structure of the external world if the rays of light emanating from it were altered in any way.

It was in a Dominican monastery in Treviso, near Venice, that the first known artistic representation of eyeglasses was painted. A man named Tommaso da Modena was commissioned to decorate the walls in 1352, and he did a series of frescoes of brothers busily reading or copying manuscripts. One holds a magnifying glass but another, Hugh of Provence, has glasses perched on his nose (left). Brother Hugh had been dead almost a century before Tommaso painted the frescoes, and nobody knows whether he actually wore glasses or not. He became a cardinal, however, and it is possible that Tommaso painted the glasses on him as a sign of respect. From the 14th century, painters also presented portraits of St. Lucy, often shown carrying her own eyes—they have even appeared as lorgnette-like glasses on a stem (p.111).

Biblical prophets and nude little cupids

Once Tommaso had established the precedent, other painters exuberantly plunked spectacles onto the noses of all sorts of subjects: Biblical prophets, nude little cupids cavorting on church walls, and St. Peter himself. These striking anachronisms are entertaining. They also offer evidence about the evolution of the design of spectacles.

The very first spectacles had quartz lenses because optical glass had not yet been developed. The lenses were set into bone, metal or even leather mountings, often shaped like two small magnifying glasses with handles riveted together typically in an inverted V-shape that could be balanced on the bridge of the nose. In this form their manufacture and use spread from Italy to the Low Countries, Germany, Spain and

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Ben Franklin wore glasses before he invented bifocals.

France. In England a Spectacle Makers' Company was formed in 1629; its coat of arms showed three pairs of spectacles and a motto: "A blessing to the aged."

It is mostly from paintings that we know how the first "rivet spectacles" looked, but a few samples have actually been found. In 1967, divers located a shipwreck in the Adriatic and recovered a box of 16th-century eyeglasses with leather-covered rims. Insurance records from Venice suggest the sunken vessel went down off Gnalić in 1583. An even earlier pair of rivet spectacles was found in London in the remains of a medieval rubbish dump near the Thames. The bone frames of this particular pair are broken and the lenses missing but the shape is unmistakable and the rivet still in place. They date to about 1440, a time when English customs records show that many eyeglasses were being imported into London on Dutch ships.

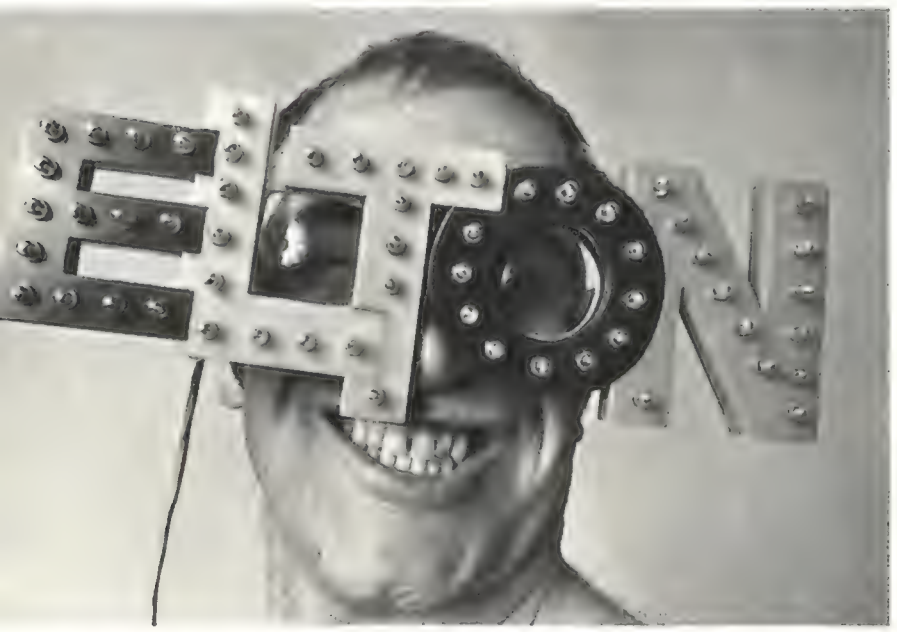
These early glasses were mostly biconvex, i.e., convex on both sides, and were "positive" or "collective" magnifying lenses to enable their wearers to read things close up. They were called simply "old" glasses because of the age of the people who needed them. The farsightedness of advancing years has been so common through the centuries that Shakespeare used it casually in his famous "All the world's a stage" description of the ages of Man: "The sixth age shifts/Into lean and slipper'd pantaloon,/With spectacles on nose, and pouch on side. . . ." At about the time Shakespeare was writing *As You Like It*, Venetian craftsmen were working out a rudimentary system of varying their lens strengths, and making glasses with symbols to indicate the prospective wearer's age. The system used one particular lens strength as a base unit, then added additional lenses to increase or decrease magnification.

From the moment they were invented, glasses posed a problem that wasn't satisfactorily solved for almost 350 years: how to keep them on. The high-bridged

In 1920s, monocle was Erich von Stroheim's signature.

Garroway's tortoiseshells went well on 1950s TV.

John Lennon helped glamorize granny glasses.



Goggle-eyed singer Elton John sports hard-sell specs.

Feminist Gloria Steinem wears "aviator" lenses.

Roman and/or English nose was admirably suited to the task, and a Frenchman, Voltaire, paid tribute to the combination in *Candide*. In this, the best of all possible worlds, says Dr. Pangloss, "Everything was made for a purpose; everything is necessary for the fulfillment of that purpose. Observe that noses have been made for spectacles; therefore we have spectacles."

A bit like small TV antennas

Wearing spectacles wasn't so easy if you had a small, straight nose. Orientals trying to balance glasses on their noses found that the things promptly slid off. Rivet spectacles pinched the nose and wearers had to hold their heads very nearly level to keep them on. Italians in about 1435 attacked the problem bizarrely. Their contraptions, sometimes known as "bow" glasses, looked a bit like small television antennas and were designed to be held firm by a curved, bowlike arm that ran from the frames up the center of the forehead, and was attached to a wire circle, close-fitting cap or a headband like those that are now used by long-haired tennis players.

By the 16th century, Spanish spectacle makers were experimenting with ribbons of silk that could be attached to the outer edge of the frames and then looped securely over the ears. This solution was eagerly accepted by thousands of glasses wearers. About 1599 El Greco painted a Spanish cardinal sporting heavy-framed glasses held in place by ear loops (SMITHSONIAN, July 1982). Spanish and Italian missionaries carried the new models triumphantly off to delighted spectacle wearers in China. The Chinese added a fillip of their own by attaching little ceramic or metal weights to the strings instead of making loops (p.108). The strings went from the outer edge of the frame across the temples, over the ears, and down the front where the weights dangled against the chest.

The final breakthrough did not come until about 1730, in London, where an optician named Edward Scarlett perfected the use of rigid sidepieces. They could be adjusted to head size, did not pinch the nose, and soon evolved into models that rested firmly in place atop the ears. The French called them *lunettes à tempes*, or temple glasses, and ecstatically proclaimed that they "permitted one to breathe easily."

All of which did not mean that the French eagerly donned glasses and ran about breathing easily. Throughout the development of glasses, French men and women were self-conscious about actually wearing glasses. Dim-eyed Parisian aristocrats used reading aids only in private. If absolutely impelled to pull out their spectacles in public, they did so hastily and surreptitiously. There, and also in England, the gentry tended to use what they called a "perspective glass," a monoc-

Early Chinese glasses are kept in place by weights dangling from ears.

Rimless glasses, on modern Mongolian, show artful mends.

Spanish invention was ribbon from frames to ears and back.

ular with a handle, which could be whipped out for a quick look and then tucked out of sight again. Proper reading glasses in horn, bone or leather frames were considered, well, unsightly, and were certainly not suitable for walking about, dancing or flirting.

In Spain attitudes were different. Hieronymous Sirturus, a Milanese who wrote a book on optics in 1612, noted that spectacles were popular among all classes in Spain because people thought glasses made them look more important and dignified. Some years after Sirturus' observation, a lady of the French court visited Madrid and wrote home that she was "surprised to see many young ladies with large spectacles on their noses and fastened to their ears. . . ." So unnerved was she by this sight that she burbled on with the theory that Spaniards had different sizes of spectacles according to their rank: "As a man increases the size of his fortune, he increases the size of his lenses."

By the 18th century, when Scarlett introduced the rigid sidepiece for the comfort of ordinary spectacle wearers, the upper classes had gone in for ornate miniature telescopes, called "prospect glasses" by the English and lorgnettes by the French. These were not for reading but for ogling—at court, at the opera, at the theater. Madame de Pompadour bought one of Vincennes porcelain and gold in 1756, and a few years later Marie Antoinette presented a tiny lorgnette embedded in an elaborate fan to a visiting noblewoman with the words "I know that, like me, you are shortsighted."

As Richard Corson notes in his fascinating book, *Fashions in Eyeglasses*, many lords and ladies objected to being obviously ogled through lorgnettes. As a result makers developed a kind of periscope with a plated mirror set at an angle inside the tube, so the ogler could point his lorgnette in one direction and look in quite another—through a hole cut in the side.

Such refinements were mere diversions in the onward march of serious reading glasses, however, and have a contemporary echo mainly in the sneering quality that hoi polloi associate with lorgnettes. In my Midwestern childhood, the word lorgnette had come to mean a pair of glasses mounted on a stick. We commonly referred to them as "a dirty look on a stick," despite the fact that except in the movies nobody I knew had actually ever seen anybody use them.

The monocle, first called an "eye ring," was introduced in England about 1800 and had snooty implications, too. One version, a single lens attached to a stick, was called a "quizzing glass" or a "quizzer." English men-about-town loved it. A young Austrian named J. F. Voigtländer (same family as the camera people), who was studying optics in London, took the idea home with him and started making monocles in Vienna about 1814. The fashion spread and took particularly vigorous root in Germany and in Russia.

There was always something about the monocle that intimidated (or provoked) the ordinary citizen. Weak-chinned and mush-mouthed Englishmen with monocles remain figures of fun to this day. So do villainous Germans in monocles, as epitomized by Erich von Stroheim. P. G. Wodehouse seems to have tried to restore some order in the monocle field in 1930, when he wrote an amusing guide to the use of spectacles for aspiring novelists. Monocles, he decreed, may be worn by 1) good dukes and 2) all Englishmen, but never by "bad men." Pince-nez, which came along in the 1840s, had no foppish or upper-class overtones. Wodehouse found them literarily suitable for 1) good college professors, 2) bank presidents and 3) musicians.

By the time farsighted or aging colonial Americans

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Upward and onward with the eyeglass

needed spectacles, they could be imported from anywhere in England or Europe. The *Boston Evening Post* of 1756 carried an advertisement: "Just imported in the Scow Two Brothers, Cpt. Marsden, from London and to be sold by Hannah Breintnall at the Sign of the Spectacles, in Second-Street near Black-Horse-Alley. Variety of the finest chrystal spectacles, set in temple, steel, leather and other frames. Likewise true Venetian green spectacles for weak or watery eyes. . . ."

Old reports of Indian serpents wearing glasses stemmed from the spectacular markings of the cobra.

Francis M. McAllister was less specific when he opened his store in Philadelphia in 1783 with "a bushel basketfull" of spectacles, through which, presumably, his customers could paw as at a shoe sale, trying on until they found something that would fit.

Only one American idea made the reverse journey back to Europe. That was the bifocal, which Ben Franklin invented in the early 1780s. Half a century later a London lens maker, who had worked in the United States and knew all about bifocals, suggested trifocals and made working designs for them. Spectacle makers were not interested, and trifocals, like contact lenses, had to wait for their day.

Even in the United States, which didn't have to suffer the growing pains of the development of spectacles, there persisted the strange web of acceptance and rejection that has always surrounded glasses. As late as 1900 an American doctor wrote that "Glasses are very disfiguring to women and girls." Generations of vain women, before and after, have bumped into doors or flunked school or inadvertently snubbed friends on the street because they agreed with him. Even in the 1930s and '40s a regular scene in romantic comedy involved a girl with secretarial glasses who stays mousy and businesslike until the hero has the wit to take off her glasses, whereupon she instantly stands revealed as a veritable Venus.

No American, in fact, has ever done for glasses what George Washington did for false teeth. In the 1920s Harold Lloyd tried his best, wearing outsize, dark-framed specs as a comic prop, but almost everybody knew there weren't any lenses in them. President Calvin Coolidge's change of eyeglass style made the newspapers in 1927, when the Associated Press reported he had given up black-rimmed specs for a pair of small pince-nez with a gold nosepiece and long black cord.

Television helped most, though, especially in the early days, when the phiz of Dave Garroway in horn-rims (his trademark) appeared to as many as six million viewers a day on the *Dave Garroway Today* show from 1952 to 1961. But it was fashion that turned the tide, as designer frames became elaborate, reasonable and varied. In 1983, the young deliberately sport steel-rimmed "granny glasses" as the ultimate chic. Role models like Gloria Steinem wear modified aviator goggles. Pop musician Elton John is never without a pair of cheaters as big as the Ritz. And the windows of opticians' shops come decorated with photographs of sex symbols Sophia Loren and Robert Redford, proudly decked in the biggest glasses they can find.

A possible prefiguration of the lorgnette was eyes on a stem carried by St. Lucy in this Cossa portrait.

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This is clearly the most complex reorganization job ever undertaken by the management of any business. But it is especially involved because of the complexity of our business. We provide a service critical to business and commerce, to government and education, to national defense, to individuals in their daily lives. We are embedded in the very life of the nation.

We're adapting our business to what the public expects.

I'd be less than truthful if I didn't say we have mixed feelings about breaking up a 100-year-old institution which has served the nation very well. On the other hand, we cannot live outside our times. And clearly, the times have changed. The American people really don't want monopoly, no matter how well regulated. They want competition and the choices that brings.

Technology has changed as well. Not too long ago, data processing was one thing, communications another. That's no longer true. As a result, many companies here and abroad have the technical know-how as well as the marketing resources to deliver high-quality communications products, services, and systems. Thus, the Bell System could not expect to operate and do business as it always has.

Never underestimate the resourcefulness and dedication of telephone people to figure out how to reach a goal.

TITURE, NOT DEMOLITION."

Chairman of the Board, AT&T

The task of divesting is vastly complicated. But we have the human talent. We have the engineering and scientific resources. And we have our pride.

While our companies will be radically changed, the basic aims of AT&T and the telephone companies will not change: to serve the communications needs of the nation, and to assure America its place as a leader in high technology worldwide.

Restructured by a Consent Decree with the Justice Department, the new AT&T will be able to develop and apply its technologies to the fullest.

In considering the Consent Decree proposal, we thought long and hard about whether the new structure would imperil our ability to serve. And of course we never would have accepted any terms that automatically would have degraded the quality of service to the nation. The Decree gives us the opportunity to build even better communications services and systems because it removes the arbitrary constraints which have limited us in the applications of our technologies.

We're eager to bring the benefits of all our innovations to the consumer in the competitive Information Age marketplace.

Both AT&T and the local phone companies have a bright future.

We're at the heart of the fastest growing, most promising industry in the country. The new AT&T—with its long-distance network and its new subsidiary, American Bell, plus Western Electric and Bell Labs—is in league with the future.

The telephone companies, which already provide a local communications system reaching virtually every home and business, are enhancing the quality and capability of their local lines so they can handle total information services: voice, video, data, even the new cellular mobile phone services. We are pledged to divest these companies in sound financial shape. We will keep that pledge.

This industry is where the opportunities and the excitement are.

If we have a truly competitive communications marketplace, with regulation only where it is needed, I believe AT&T and the divested telephone companies have a significant and constructive role to play in revitalizing the American economy and in maintaining and enhancing US technological leadership in communications.

The Bell System as we now know it will be no more. We will divest. But we are not demolishing the promise of tomorrow. That promise is alive and well. Bell System people are ready for new directions.

Bell System

By George Kittle

A photographic file covers 80 years of our artistic history

The fight to preserve the invaluable film archive of the Juleys, father and son, is waged at the National Museum of American Art

Peter A. Juley's start was modest: a combined photo studio and barbershop in Cold Spring, New York.

Between 1896, when Peter A. Juley opened his first studio, and 1975, when his son Paul died, the New York firm of Peter A. Juley and Son photographed the work of virtually every important artist in America, as well as that of many who, though well-known in their time, are all but forgotten today. The Juleys were simply the best in the business, and everybody used them—not just artists, but also museums, galleries, corporations and private collectors. They were the official photographers for the National Academy of Design and the Society of American Artists, which merged with the Academy in 1906. They covered exhibitions, did auction catalogs, photographed juries, and took literally thousands of pictures of the artists themselves, both in New York and in their summer art colonies. When the firm closed in 1975, the studio housed 126,000 negatives, stuffed into cardboard boxes and manila envelopes and labeled with names like Homer, Sargent, Eakins, Bellows, Hopper, Marin, Motherwell —a treasure trove chronicling 80 years of art and the art scene in America.

When in 1966 the Smithsonian's National Museum of American Art (then called the National Collection of Fine Arts) contracted with Paul Juley to acquire the collection, it was known that many of the earlier images were on fragile glass plates. Many were also known to be on cellulose nitrate film, of high quality and widely used until the advent of safety film in the 1930s, but a highly volatile and unstable film that was apt to deteriorate at an uncontrollable rate. What was not discovered until later was that roughly a third of the collection, or 40,000 negatives, had been exposed on nitrate film.

Already nearly a thousand images have been lost, and despite rigid temperature and humidity controls more will probably succumb, for nitrate decay is like a disease that strikes without warning and, once entrenched, proceeds inexorably along its grisly course. The first sign is an amber discoloration and fading of the image; then, in successive stages, the emulsion becomes sticky and surfaces tend to adhere, gas bubbles form and noxious fumes are emitted, the film is covered with a viscous froth, and finally the negative dissolves into an acrid brownish powder (p.118). The museum is now engaged in a race against the clock to preserve the endangered negatives before further damage occurs and more images of American art are lost forever—for in many cases the Juley negative is the only record of works of art that have been lost, destroyed, damaged, forgotten, or sequestered by collectors, or have been irreversibly altered by time or the restorer's brush.

Peter A. Juley (born "July," the "e" having been inserted by a helpful immigration official) came to America in 1888 from Alf, a small German town on the Mosel River, where he had worked as a postal assistant. Somewhere along the way he must have picked up some knowledge of photography, for in 1896 he opened a barbershop-cum-photo studio in the Hudson River hamlet of Cold Spring, New York (above). Fol-

Sidney E. Dickinson's portrait of Paul Juley, 1950,
also includes a picture of Paul's father, Peter.

lowing a stint on *Harper's Weekly* between 1901 and 1906—he photographed President McKinley's funeral and accompanied President Theodore Roosevelt on his national tours—he opened another studio, without barbershop, in New York City. Just how he came to specialize in fine-arts photography is not known, but it was a shrewd choice, for the Juleys dominated the field for many years.

In 1908, at age 18, Paul Juley joined his father's business, and a few years later they took on a young art student from Barbados named Carlton Thorpe to handle customer relations and to help out in the darkroom. Carlton, as he was known to everyone, soon made himself indispensable to the smooth running of the firm, where he remained until the end.

As for Peter Juley, he was, according to Carlton, "a gentleman of the old school." Lloyd Goodrich of the Whitney Museum of American Art found him "a bit gruff, perhaps, but very pleasant, and he was a great expert: he knew just how to light a picture." (Years later, when writing a book on Albert Pinkham Ryder, Goodrich relied heavily on Juley photographs to show what Ryder's paintings, by then deteriorated or "restored" almost beyond recognition, originally looked like.) Artist Allyn Cox remembered Peter Juley coming to the studio of his father, muralist Kenyon Cox: "He was very conscientious; he used a thread to measure the distance from the four corners of the picture to the camera to make sure that he was exactly in the center."

In the early days Peter worked with 8-by-10-inch, or even 11-by-14-inch glass plates, using a huge mahogany camera he is said to have made himself, to photograph the works, and in many cases the visages, of such 19th-century figures as Augustus Saint-Gaudens, Winslow Homer, Thomas Eakins and Albert Pinkham Ryder. In the first decade of the 20th century, that period of rebellion against the art establishment that led up to the Armory Show of 1913, he covered in depth the work of the "Ashcan School," led by Robert Henri and including John Sloan, George Luks, William Glackens and Maurice Prendergast.

In the years to come he chronicled the work of George Bellows, Thomas Hart Benton, Grant Wood and Reginald Marsh, along with more "modern" painters such as Max Weber, Alfred Maurer and Charles Burchfield. In sculpture, the firm's clients ranged from Daniel Chester French to Gaston Lachaise, Malvina Hoffman and William Zorach. Peter Juley, a sober, hard-working, laconic man, died in 1937, just short of his 75th birthday.

Paul was quite different from his father. More gregarious, he never missed his Friday nights at the Salmagundi Club, where, in the gemütlichkeit of the wood-paneled rooms, he would shoot pool and swap stories with the artists who were his clients by day. "He was on a first-name basis with all of them," recalls artist Adrian Lamb. Another Salmagundian, Ogden Pleissner, describes him as "a kind, gentle man—everyone was crazy about him—but he was the world's worst driver: he'd drive me down to the Club on Fridays and I'd have the door half open all the way, ready to jump out." In summer Paul combined business with pleasure by visiting the art colonies at Woodstock, New York; Mystic and Lyme, Connecticut; and Provincetown, Rockport and Gloucester, Massachusetts.

A technique called "painting with light"

Though he enjoyed a good time, when it came to work Paul was as much of a perfectionist as his father. "He had a great love for his art," says Lamb, "and it *was* an art, as he did it." Pleissner recalls bringing a painting to the Juley studio: "Paul put it on an easel that moved back and forth on tracks, and shot it with his enormous studio camera that was mounted on springs to absorb vibrations from the street." If paintings were too big or too numerous to bring to him, Paul went to the artist. For murals or very large paintings he used a technique some have called "painting with light." He would set up the camera, turn off the lights, open the shutter, and using a portable light "paint" first one side and then the other of the picture with an up-and-down motion. He got excellent results with this seemingly haphazard method.

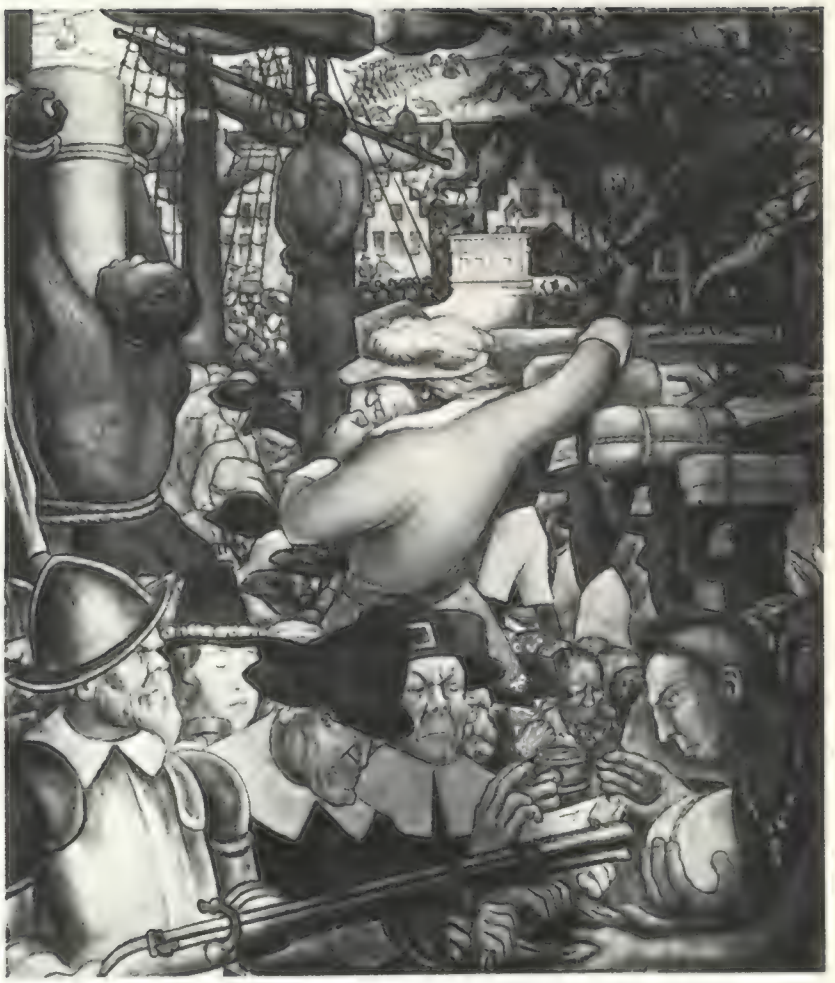
Paul's color work was also highly regarded. "Everyone went to him," says Pleissner, "because he was one of the few using the dye-transfer method." Another

A free-lance writer living in Connecticut, George Kittle has a special interest in photographic history and has written several articles on the subject.

Lost . . . except for the Juley record

Edward Hopper's *Corn Belt City*, 1947, was destroyed by a fire in New York City during the mid-1970s.

Robert Henri's portrait of Bernard Baruch was lost in a fire in 1932; Juley photograph is sole record of it.



Juley photograph is only record of mural panel, *Conquest*, by Diego Rivera, lost in fire in mid-1960s.

Ernest Blumenschein's *Three Riders*, 1919, was later cut in half and lost. Juley photograph shows original.

Salmagundi Club pool-playing crony of Paul's, A. Henry Nordhausen, recalls his making "some of the most magnificent color reproductions of murals I've ever seen." But unfortunately none of Paul's color work exists in the collection.

Some time after his father's death Paul moved the studio from East 39th Street to West 57th Street, a few doors away from the Art Students League. It proved to be a mutually beneficial juxtaposition. Students and faculty could bring a painting over to the studio, give it to Carlton, and have a finished print that day or the next morning. Juley kept costs down for his clients, many of whom repaid him by remaining lifelong customers. Thus in many cases the Juley negatives trace the evolution of an artist's style throughout his career. Though Paul had little use for abstract art, which he found as difficult to photograph as to understand ("all gray with a spot in the middle" was his summation of one canvas), this did not stop him from working for galleries that handled painters like Robert Motherwell, who is represented in the collection by more than 450 negatives.

As the years rolled by, and other photographers with more advanced equipment appeared on the scene, Paul made no attempt to keep up with the times or to train someone to take over the business. The death of his second wife in 1966 was a shattering loss. He moved to a small apartment near the studio, but his real home was now the Salmagundi Club. He kept going right to the end—he photographed the Washington Square Outdoor Art Exhibit the year he died as he had for the past 25, lumbering around the sidewalks like an old St. Bernard, lugging his old-fashioned camera and tripod, a cigar clenched between hypo-stained fingers—but he was, understandably, slowing down. In 1974, at the age of 84, he notified the Smithsonian museum of his intention to retire, and asked them to take the collection off his hands.

The museum sent Eleanor Fink, chief of the Office of Research Support, to New York to look over the collection, take inventory and identify any problems that might be involved in packing it and shipping it to

Print made from nitrate-damaged Juley negative shows center eaten out of Frieske's *Lady on a Gold Couch.*

Alexander Calder's *Woman With Lamp Shade,* 1928, was one of his whimsical pieces. It has disappeared.

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Juley archive includes shots by other photographers such as this one of a Robert Henri class in 1907.

Washington. Mrs. Fink describes her first visit: "It was hot outside, but in the studio the shades were drawn and it was cool and quiet, and there was a smell of chemicals. The hallway walls were plastered with photographs of artists, and the studio was lined from floor to ceiling with shelves holding boxes and envelopes bulging with negatives, including glass plates. The spines bore names like Albert Pinkham Ryder and William Merritt Chase. It was like stepping back in time."

In the days that followed she observed the routine. "When Juley came in, Carlton would have prepared his desk, laying out the newspaper, the coffee cup, the knife and fork and plate for his lunchtime piece of fruit. Juley would go through the bills and then doze off, pipe in mouth, until the telephone shattered the silence. It would ring for a long time, for neither of them moved very fast. Occasionally an artist would stroll in wanting a print. He would go straight to Carlton, as only he knew where things were.

"We discovered the first nitrate damage in negatives that were stuck together—Juley never bothered putting them in individual sleeves. But how much damage was there? And how to proceed? To go through every box would take too long, and Juley was anxious to close the shop. The best plan seemed to be to bring it all down to Washington. But it's illegal to store nitrate film in the District, because it can spontaneously combust at relatively low temperatures.

"I spent much of that year trying to find a place to store the film," Mrs. Fink explained. "The National Archives offered us space in their Maryland vaults, but later had to renege to make room for the *March of Time* collection. Some of the other spaces offered us were an abandoned silo, a capsized trailer with a broken axle, and a section of a facility in Virginia." Finally, storage space was found just outside the District, and in October 1975, Mrs. Fink returned to New York to supervise packing and shipping. Given the Juley filing system, this was no small task; she devised a method not unlike that used by archaeologists in taking apart Egyptian temples for reassembly elsewhere.

Juley had declined noticeably in the intervening year; in fact, he was not to live into retirement. On October 31, Mrs. Fink interviewed him on videotape in his now bare studio. It was to be his last visit to his studio, for a few days later he was taken to the hospital,

Paul P. Juley poses with his mahogany-cased camera in his studio at 225 West 57th Street in about 1960.

where he died of pneumonia on November 14. Because it was a live archive until that day, many artists were upset on learning that the collection was leaving New York, even though they were assured they could obtain prints from the museum. And the National Museum of American Art is actually an ideal repository for the collection.

Mrs. Fink explains: "It was the philosophy of our late director, Dr. Joshua Taylor, that a museum of American art should cover as broad a spectrum as possible, representing less well known artists along with the more familiar names. Toward that end the museum mounts about 15 exhibitions a year, often exploring the byways of American art, and every work in every show is photographed for the museum's archives, for this is definitely a research-oriented institution. The Juley collection, with its enormous breadth of coverage, fits in perfectly with Dr. Taylor's vision." The museum's present director, Dr. Charles C. Eldredge, describes the Juley material as "an unparalleled record of our visual history whose preservation is of the highest priority."

With the collection in Washington, the mammoth task began. The plan was to isolate the nitrate film and to convert it to a stable type of film before deterioration set in, and eventually to make an archival-quality print from each of the 126,000 negatives. The facilities of the Smithsonian Office of Printing and Photographic Services would be used for this. At the same time, Mrs. Fink began the job of compiling a computerized index of the collection. Incidentally, the roster of artists in the collection is not limited to those who were contemporary with the firm's life. For one thing, the Juleys acquired collections of other photographers as they died or retired. (One such was DeWitt Ward, a highly regarded turn-of-the-century photographer who left some 200 negatives, including many of Augustus Saint-Gaudens' sculptures.) Also, because the Juleys photographed many private collections in addition to their work for galleries and museums, there are works by very early artists, such as Gilbert Stuart and John Singleton Copley, as well as a sprinkling of Europeans.

An invaluable record of lost works

"Originally we planned to proceed at a leisurely pace over a ten- or 15-year period," Mrs. Fink recalls, "an acceptable timetable under ordinary circumstances. But then, in sorting the negatives, we discovered how much nitrate damage there was. An entire box of negatives of muralist Edwin Howland Blashfield (p. 124) was ruined. Altogether we had to throw out over 900 negatives—and we knew that fresh damage could occur at any time. I tried to get things moving faster, but there were all kinds of delays. It was very frustrating."

Meanwhile, as word got around that the Juley collection was at the NMAA, Mrs. Fink began to get queries from researchers, curators and private individuals all over the country, asking if the Juleys had photographed a certain work that had been damaged, lost or destroyed. Among such for which there was indeed a Juley negative were 13 Diego Rivera panels that were destroyed in the International Ladies Garment Workers Union fire in the Poconos in the 1960s (p.117); some murals José Clemente Orozco did for the New School for Social Research in New York, which have flaked badly; preliminary and intermediate maquettes of A. Stirling Calder's 1926 *Shakespeare Memorial* in Philadelphia, showing the evolution of this work; one of his son Alexander's whimsical sculptures, *Woman with Lamp Shade* (p.118), presumed destroyed; Edward Hopper's *Corn Belt City* (p.117), destroyed by fire; three missing John Sloan paintings; and several lost or altered works by John La Farge, including some on which inscriptions providing information essential to their meaning are illegible but clearly decipherable on the Juley negatives.

Two other areas where the collection was proving

Above all. Grand Marnier.

useful were restoration and the location of missing artworks. "Restoration is pretty difficult if you don't know what the work originally looked like," Mrs. Fink points out. "We've been able to supply owners with Juley prints of their paintings so the conservators would have something to go by." Among the more obscure works that have been located by publishing Juley photographs in museum bulletins or by using them for scholarly research, are a Maurice Prendergast in a private collection, and a box entitled *Midnight Carousel* by Joseph Cornell (SMITHSONIAN, January 1981) which was traced to the Fogg Art Museum. More uses will be found. The 4,500 photographs of artists, ranging from formal portraits to candid shots in their studios (below), will provide fresh images for art historians as well as shed light on the artists' working methods. And photographs of works-in-progress, such as those Paul Juley took of John Singer Sargent portraits in their various stages, will be of wide interest to students.

As the value of the collection became more apparent, so did the need to accelerate the preservation program. By 1979 only 14,000 prints had been made. And the nitrate film was like a burning fuse. Clearly something had to be done, and quickly. This meant private funding, for the Smithsonian, being a government institution, is ineligible for National Endowment grants. Through the generosity of the Samuel H. Kress Foundation and the James Smithson Society, the preservation project was launched. Most recently, the J. Paul Getty Center for the History of Art and the Humanities has agreed to purchase a print of each negative in the Juley Collection for its photo archives. Money from the sale of these prints will help support the Smithsonian's project.

"With this support, we have been able to hire the kind of specialists we needed," notes Mrs. Fink. "We now have three people—with backgrounds in art as well as photography—working full-time on the printing program. At the same time the nitrate conversion program is going full-speed ahead—we're using Kodak SO-015, a direct-duplicating film that gives excellent results. Although we now have made some 30,000 prints, eventually we hope to have the whole collection on microfiche or videodisc to make it more accessible to scholars and researchers. We've got our hands full now just trying to get a good print from each negative before we lose any more—because nitrate won't wait."

Peter and Paul Juley would probably be astonished at the fuss being made over their negatives, because they had little sense of their historical importance. The extent of this importance will not be known until the work is completed and people actually come to the Smithsonian and use the resource, but it is safe to say that as a single comprehensive photographic record of American art, nothing rivals the Juley archive.

Juley portrait of the familiar painter John Marin is one of some 4,500 artists' portraits in the collection.

Edwin Howland Blashfield (1848-1936) wore his customary studio clothing for this Juley study.

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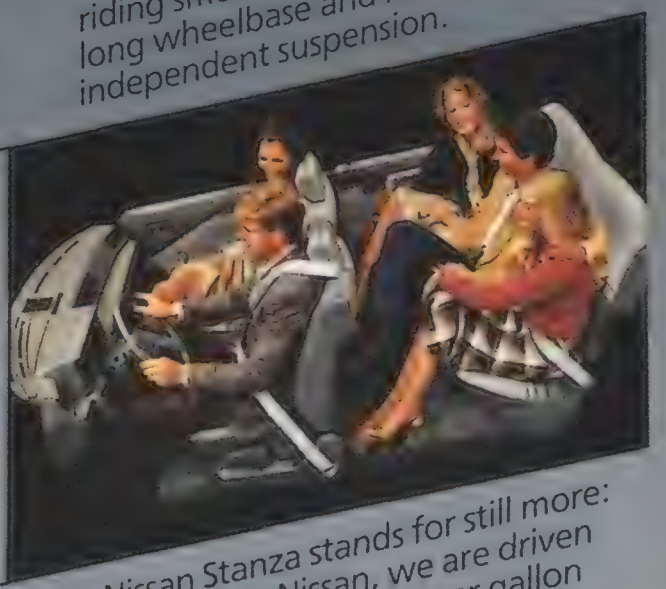

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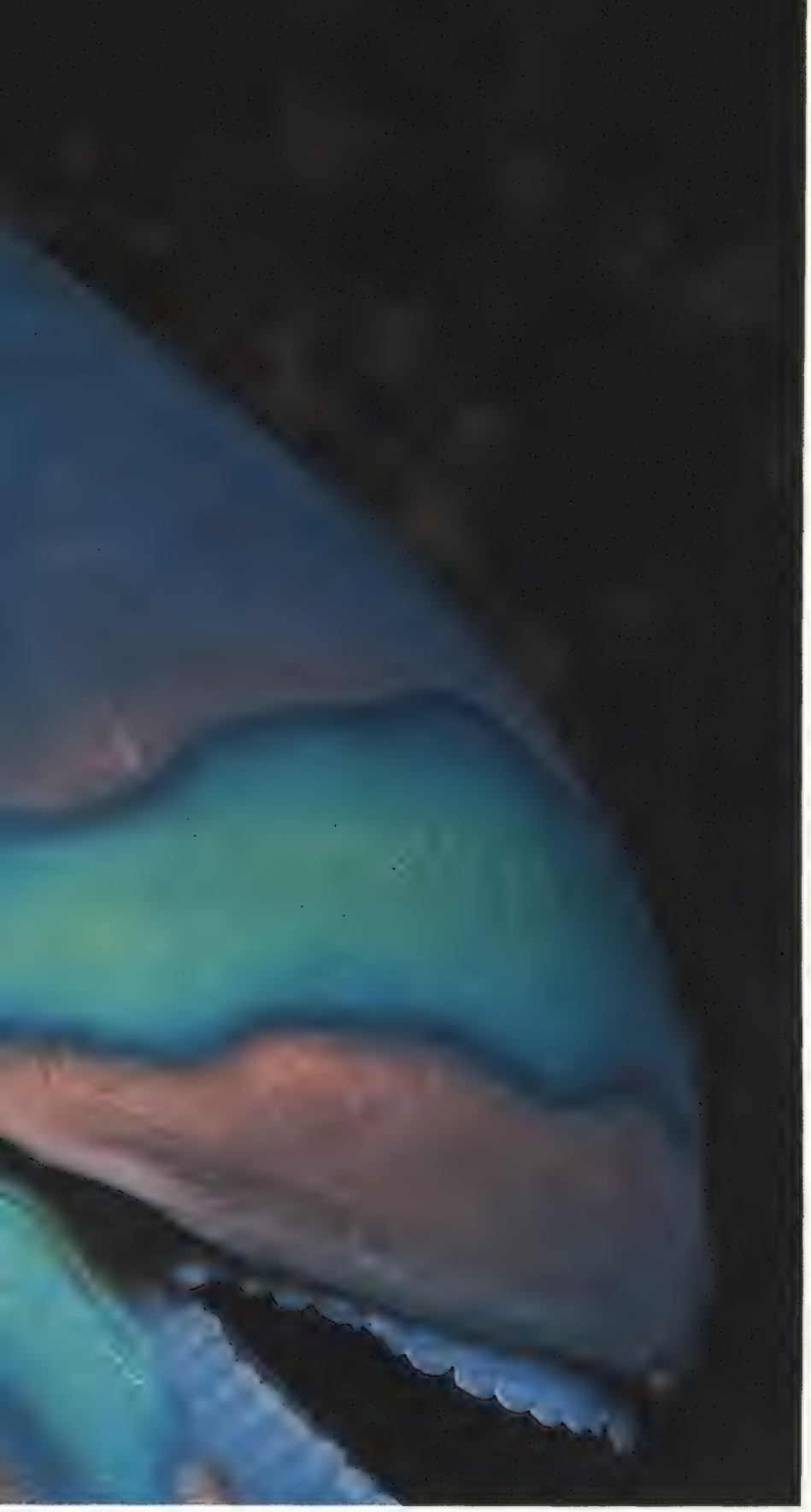
The brilliant colors of some marine creatures, such as this parrot fish, have long fascinated biologists.

By Joseph S. Levine

Life imitates art in pageant of color beneath the sea

Whether for concealment or self-advertisement, marine animals produce and mix hues in so many ways that a painter could well despair



Colors abound under the sea, from emerald-green algal tufts and vibrantly hued corals to the maelstrom of iridescent fins and scales that lend splendor to fishes of every size and description. No single artist could have conjured such an eclectic assemblage of colors and shapes into existence. In the briefest underwater sojourn, a diver can spot secretive, somber-hued creatures sufficiently surreal to have crawled off a canvas by Dali; improbable, angular fishes and invertebrates with bright, bold patterns and swift, assertive movements that could have tumbled from Picasso's sketchbook; and dozens of species upon whose bodies the interplay of light, shadow, color and form create effects that just might draw sighs of envy from Monet.

Biologists, awed at the inexhaustible variety and intricacy of these visual special effects, are also intrigued with their evolutionary significance. How are these colors generated? What are their biological functions?

Both artists and the living organisms that they strive to portray face similar requirements when they need to produce colors. Sunlight, or "white" light, is composed of electromagnetic energy covering a broad range from blue (short) to red (long) wavelengths. The presence of all these wavelengths gives an impression of a light devoid of color, so that midday sunlight looks neutral. The white plumes of egrets reflect large amounts of all visible wavelengths, while the black fur of the panther absorbs most visible light, reflecting very little.

The colored pigments on an artist's palette, on the other hand, absorb light of certain wavelengths while reflecting others. Hundreds of biological compounds cause organisms to absorb or reflect different wavelengths of light.

Visual signals are a matter of survival

To most aquatic animals, the utility of these color pigments lies in the wavelengths of light they reflect, for, in an evolutionary sense, animals use biological pigments the way humans use paints: to generate colors meant to be seen as visual signals. The ability to survive and reproduce in a competitive environment is the basic stuff of evolution, and visual signals—to the extent that their formation has been guided by natural selection—have evolved to help animals find and locate each other, to aid them in hiding, to help them catch their food or to avoid being eaten.

Among many coral-reef fishes, for example, males and females must locate each other from among scores of individuals belonging to numerous species. Both sexes can advertise their presence and readiness to mate by flaunting unique, highly visible color patterns on their bodies, boldly proclaiming their species, gender and physiological condition.

Ostentatious visual displays, however, carry a not-so-subtle risk: conspicuous animals make easy targets for predators. To hide from carnivores that use vision to locate their prey, many animals simply act like rocks, and assume shapes, textures, color patterns and appropriate behaviors that enable them to blend in with their surroundings.

Not all of these species are innocent or harmless waifs that use their powers of color concealment strictly for defensive purposes. Many and varied are the ways of making a living in the marine environment, and quite a few aquatic predators don their disguises to

Photographs by Jeffrey L. Rotman

North Atlantic octopus changes color quickly (below) after being disturbed by photographer's approach.

conceal themselves from unwary prey until they can make a well-timed lunge.

But how do these animals generate the colors that make possible their various kinds of visual subterfuge? Shallow-water marine animals like chitons are faced with the task of blending into a multicolored Persian carpet of green, red and brown algae. Chitons match colors in a most straightforward fashion: they simply devour the plants in their immediate vicinity and sequester the ingested pigments in their own armadillolike shells. Visually, they are what they eat.

As effective as concealment techniques are for sedentary beasts, the static images they present are not enough for active species that move from one background to another. Fishes and certain higher invertebrates have more complicated and dynamic means of generating visual signals, involving specialized skin cells and several assorted colored pigments.

Melanins, a class of compounds ranging in color from brown to black, are actively synthesized by many animals from fish to humans, where they are responsible both for the differences in skin color among races and for the "tanning" following exposure to sunlight. Melanin is usually found in the form of small granules called melanosomes, which are located within large, branching cells called melanophores. Unlike humans, many animals can actually control the distribution of the granules within their melanophores. In the same amount of time it takes a human to blush, the nervous systems of fishes can cause either dispersal or aggregation of melanosomes, changing their skin shade from dark to light in less than a minute. Although fishes never blush out of embarrassment, they often do change color out of fear, to signal success or defeat in aggressive or sexual encounters, or to improve their concealment after moving to lighter or darker areas. Anyone who has ever watched aquarium fish develop, lose and then regain stripes or bars in a matter of minutes has seen melanosomes in action.

If fishes' control of black pigments is intriguing, their fabrication of white, silver and blue is little short of amazing. Lacking access to magnesium oxides and similar compounds used by artists to create brilliant reflective surfaces, fishes have pressed into service one of the most ubiquitous organic compounds in nature: the amino acid guanine, a major component of DNA. Guanine crystals take the form of tiny, flattened plates that reflect light, acting in effect like so many microscopic mirrors. Myriad crystals are deployed in parallel arrays in cells called iridophores, where they reflect light of most wavelengths, giving the impression of a

Joseph S. Levine, a diver, biologist and professor at Boston College, described poisons marine creatures use, in the September 1981 SMITHSONIAN.

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A well-concealed flathead blends into the bottom of the Red Sea as it waits for some unobservant prey.

Even more difficult to see is this Moses sole, so well has it managed to merge into the sandy background.

white, or silvery, surface. By varying the orientation of these crystals ever so slightly, they can be made to produce the flashing silver so often seen in herringlike fishes. Silver lamé, it appears, was fashionable in the sea long before it was co-opted by dress designers.

Guanine crystals are also spread out under layers of other pigmented cells in the skins of aquatic animals, where they act like the white undercoat applied to a canvas before painting. By bouncing back light that would otherwise be absorbed by the tissues of the animal, the guanine layer adds sparkle and brilliance to other colors laid down on top of it.

The shimmering blue of a dying fish

Still another visual special effect is often "done with mirrors." Rare is the fisherman who, marveling at the iridescent blues shimmering across the scales of a freshly landed game fish, has not been sorely disappointed at the speed with which those colors disappeared upon drying. No taxidermist can recreate them, and no photographic film can precisely duplicate their appearance, for, in most families of fishes, they are caused not by a blue pigment, but by an astonishingly well-ordered, layered array of guanine crystals.

When set at just the right angle and spaced precisely the correct distance apart, guanine platelets create optical interference phenomena. The same interference phenomenon generates colors in soap bubbles. In addition to explaining the almost magical interplay of hues these platelet arrays produce in living fishes, observations on these structural colors provide a simple reason for their disappearance upon drying. Desiccation of the tissue causes changes in the spacing and orientation of the crystals, destroying the effect.

Another major group of coloring compounds used in fishes is the carotenoids. Oddly enough, despite their abundance in fishes, carotenoids cannot be synthesized from scratch by vertebrates, and must therefore be obtained by eating either plants or other animals that contain them. These "pirated pigments" may be used exactly as they are ingested or they may be chemically altered by the fishes to change their hue slightly before they are funneled into cells called xanthophores (if the pigment is yellowish), or erythrophores (if the pigment is red). Because of the way certain carotenoids absorb light, changing the concentration of a carotenoid in these cells (without changing their chemical composition) can actually change the cell's apparent color from yellow through orange to deep red.

Melanophores, iridophores, xanthophores—together these cells and their pigments provide fishes with everything they need to generate black, white, silver, blue, yellow and red. The living canvas is stretched and ready and the forces of natural selection need only vary

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the arrangements and combinations of these cell types to achieve an almost infinite variety of color effects.

Combine a short-wave-reflecting guanine layer with a thick undercoat of melanin to absorb the long-wave light passing through the iridophores and—presto!—a deep-blue color results. If the same kind of blue structural color is treated with a yellow xanthophore layer and a reflecting undercoat, the blue light reflected from the interference filter combines with the yellow light that has passed through the xanthophore layer and bounced back out—and the mixture appears green.

The potential of these combined cell types goes much further. As any artist knows, lightness is as crucial as hue in effecting a proper color match, and the addition of black to many colors can actually make them appear to change in hue: lemon yellow with black looks green, whereas red and orange change to shades of brown when mixed with black. Our piscine impresarios, therefore, simply by expanding and contracting melanophores in the light path, can generate a phenomenal range of shades and tints while relying on only a small variety of carotenoids.

Flatfishes have an almost legendary ability to make themselves disappear before a variety of backgrounds (p. 130). In fact, these particular masters of disguise can change neither their colors nor their basic body patterns rapidly enough to hide themselves. What they can do, by precisely controlling their chromatophores, is match the general level of brightness and contrast of their backgrounds. This second-best method works as well as it does only because the flatfishes combine it with another trick: they are quite adept at blurring the visual boundaries between their bodies and the sea floor. They settle to the bottom in a flurry of fins and tails, stirring up a cloud of sand. When the sand settles, it falls haphazardly atop their fins, obscuring the critical edge so important in visual perception.

The clown fish, named for its bright colors and gaudy markings, is generally found near an anemone.

Somehow, these fishes seem to know their limitations. They never try to hide on corals or sponges, and they rarely come to rest for long on pebbles or rocks, avoiding those highly colored and distinctly patterned areas in favor of the more neutral-colored, less-strongly featured sandy bottoms.

Despite fishes' mastery of disguise, when it comes to speed and adaptability they must bow to the ocean's champion quick-change artist, the octopus (p. 128). Although most of its cephalopod relatives, like squid and cuttlefish, have reasonably good control over their chromatophores, none can match the speed with which octopuses can flush and fade, blanch and darken. When excited, octopuses can cause wave after wave of color to ripple over their bodies and, when trying to hide, they can melt into their background with astonishing speed.

Thus far, we have restricted our attention to bottom-dwelling species whose leisurely life-styles allow or require them to sit still and hide most of the time. What about the colored pigments and patterns of the spectacular reef animals that first commanded our atten-

Splashed with blue spots, this Red Sea grouper is downright flashy and hard to miss in the light of day.

tion? The electrifying visual displays of butterfly fishes, angelfishes and other species active primarily during the day cry out for explanation.

Some biologists argue that, regardless of how conspicuous these color patterns seem, they still function as concealment. The idea is that bold, irregularly shaped patches of light, dark and color break up the familiar features of an animal's body and detract attention from its outline. If these patches happen to match objects in the animal's background, so much the better, but visual disruption is the critical factor. This explanation, however, would seem to cover only certain cases, especially those species that "freeze" when frightened.

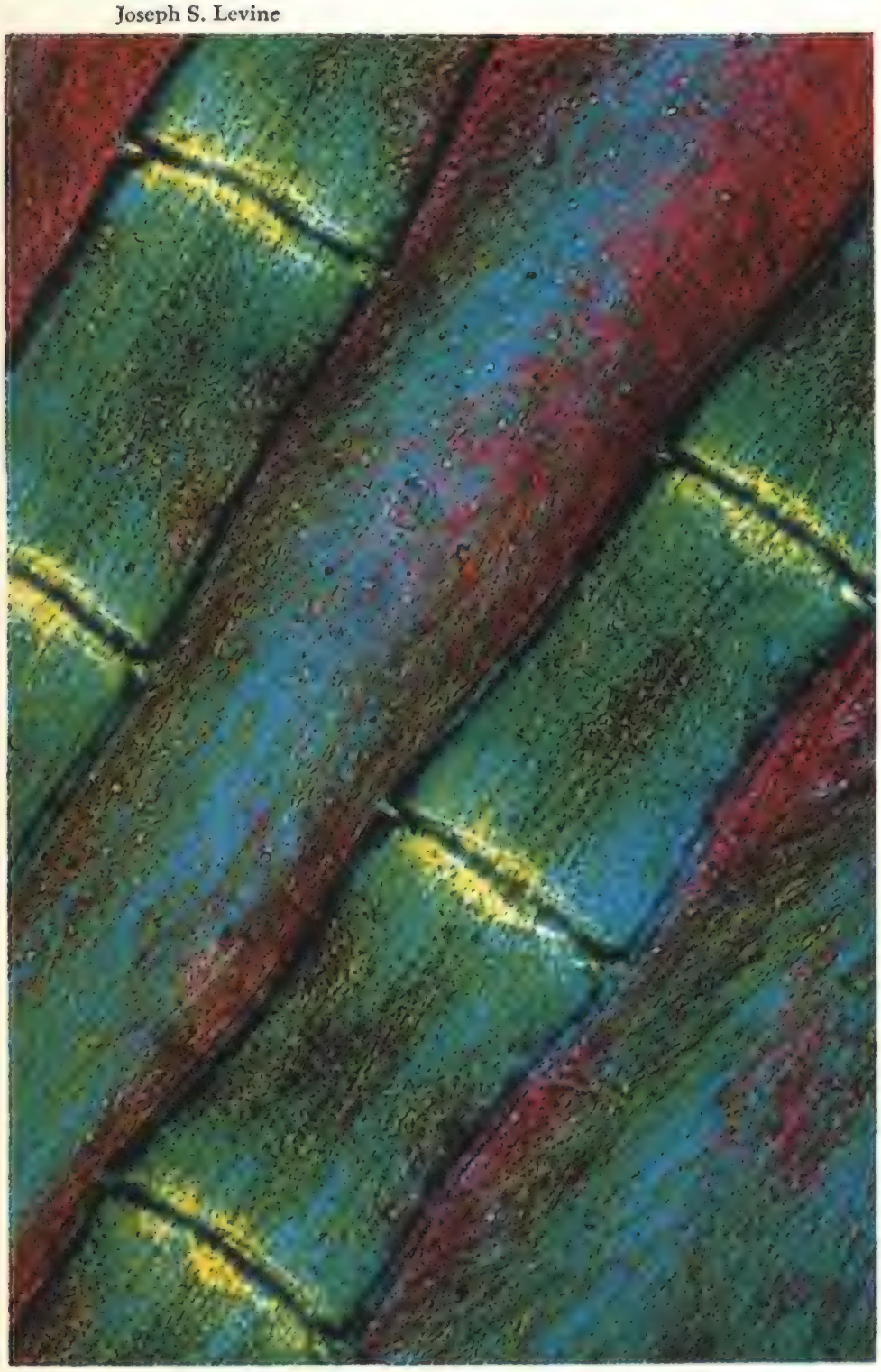
What of the others, whose colors fairly leap out at observers and precisely delineate rather than conceal body outline? How—in an environment "red in tooth and claw"—can these species afford the luxury of discarding concealing coloration in favor of conspicuous haute couture? Color camouflage is critical only to species whose major predators rely on vision to hunt when there is ample sunlight for all to see with.

Recent research has shown that this is not the case on the reef. On the contrary, most important visually-dependent reef predators (aside from camouflaged ambush hunters) do not hunt during the day when their prey can spot them easily. Rather, they concentrate their hunting efforts in the visually confusing dawn-and-dusk twilight periods when the eyes of their prey are at the same disadvantage as human eyes when confronted with semidarkness. The eyes of these predators, on the other hand, are large and very sensitive to dim light but—like old-fashioned, high-speed photographic film—they are not particularly good at distinguishing colors and can offer only grainy images that fail to resolve detailed patterns. Thus, in this hypothesis, strictly daytime species—which run for cover when twilight descends—are free from the threat of attack by predators that would home in on bright colors. If daytime species have no need for concealing coloration to help them find their own food, any evolutionary trend toward conspicuousness would be unopposed by a countering selection pressure for protective coloration.

Still, why are these fishes so conspicuously colored? What benefits could accrue from making a visual spectacle of oneself? Konrad Lorenz, the Austrian ethologist, was so impressed with the visibility of many coral-reef fishes that he coined the term *Plakatfarben*, or "poster colors," to emphasize his conviction that animals sport these color patterns to function as living billboards. He realized that yellow stripes, red bars and electric-blue spots can advertise and identify the species and sex of fishes.

The reef, Lorenz reasoned, is a community of notoriously picky eaters, with some species subsisting entirely on the polyps of one coral species, while others dine exclusively on the tips of a particularly tasty

Joseph S. Levine



Special optics dramatize the density of erythrophores and xanthophores (red areas) in rays of fish tail.

sponge. If these specific food items, or territories in which they can be found, limit the population size of a species, it is to an individual's advantage to defend turf against competitors. On the densely populated reef it would be a futile waste of time and effort, however, to attempt territorial defense against swarms of noncompetitors; thus, Lorenz argued, an ability to recognize and then scare off only individuals with similar appetites would eliminate unnecessary, interspecific warfare.

Later work has suggested that bright colors sometimes serve other functions. Finding a suitable mate in a crowd can be as problematical for fishes, for example, as it apparently is for frequenters of singles bars. Striking color patterns provide reliable cues to the identity of prospective mates.

In some cases, conspicuous color patterns can confuse predators as to which end of the prey is which. Many poster-colored fish have a highly conspicuous bar or stripe across the head which passes uninterrupted through the eye. This makes the eye difficult to spot. The same fish may have a false eyespot elsewhere on its body, which may fool predators into thinking the prey will dart one way when, in fact, it will go another.

If these hypotheses are correct, and the poster-colored fishes actually are using their bodies as advertisements, has natural selection advised them as well as a media consultant might have? Are their patterns and colors maximally visible in their particular environment? Analysis of the visual conditions present on coral reefs—which nondivers can experience by donning a pair of turquoise sunglasses—reveals that two methods of generating highly effective visual signals exist there. The adaptable reef fishes, not surprisingly, use both.

Black-and-white combinations work best

Fishes, like artists, appear to know full well the attention-getting effect caused by juxtaposition of black-and-white stripes. A survey of the patterns of Hawaiian reef fishes recently determined that, despite their reputation for flamboyant coloration, these animals actually used combinations of black and white more frequently than any of the other effects available. As might be expected, white areas are generated by guanine crystals, while the black regions contain dense populations of melanophores.

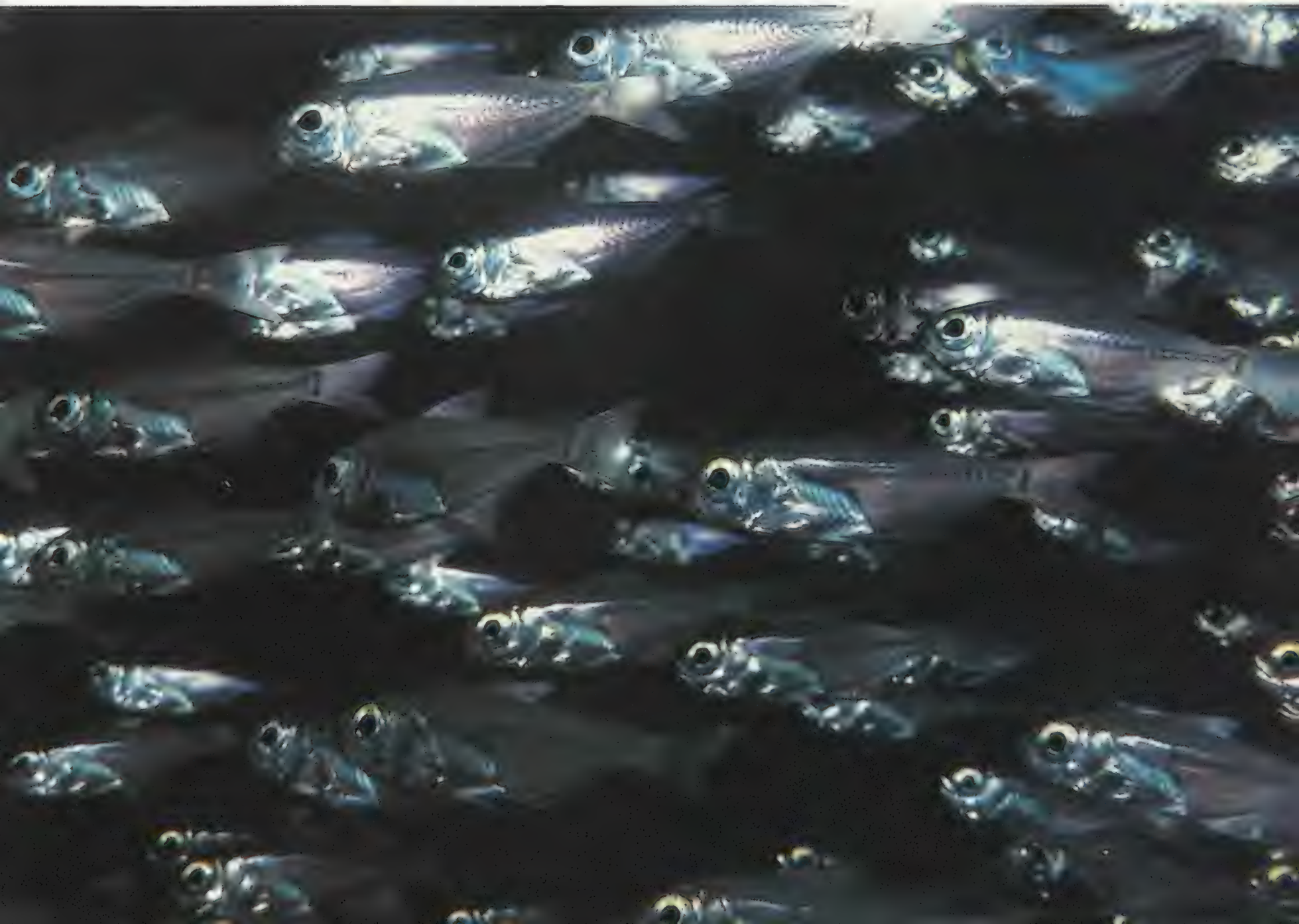
A second means of gaining conspicuousness is to add color contrast to brightness contrast. The best way to do this is to add to the poster board a pair of contrasting colors that are distinctly different from each other in terms of the energy they reflect, but that are both highly visible in the soft, blue glow that pervades the reef environment. Yellow and deep blue fit this

requirement well, and can easily be created by overlaying white areas with xanthophores to create yellow, and covering the black areas with guanine interference filters to create blues. Our body-coloration survey confirmed that blue and yellow were the most common colors in reef fishes.

One final note on coloration needs to be added, for, despite the fact that nature rarely divides organisms into neat little categories, we have so far selected species that are believed to be under clear-cut and consistent evolutionary pressure either to blend in with or stand out from their surroundings. In reality, organisms are rarely exposed to such simple sets of circumstances and, for many, the evolutionary choice between concealment and conspicuousness is not simple. Any animal threatened by visual hunters can avoid being made into a meal more easily if it makes itself as inconspicuous as possible. Visual advertising to attract a mate, however, requires conspicuous coloration. What is a threatened but sexually ready fish to do? Many species adopt concealment for most of the year, reserving their "coat of conspicuous colors" for the mating season. The Atlantic sea raven is such a species; well camouflaged most of the time, it becomes intensely colored during the breeding season. The precise colors it assumes can vary from a brilliant yellow, the most visible color in blue water, to oranges or reds that are more clearly seen in the green waters of temperate marine environments.

Colored compounds in marine organisms serve an enormous number of uses, from absorbing light for photosynthesis to reflecting it for visual displays; from concealment to conspicuousness and a little of everything in between. These pigments are a multihued testimonial to adaptability and variety in nature, simultaneously serving their biological purposes and providing observers with an ever-changing tapestry of living creatures. A Japanese art historian once remarked that "one can conduct a spectrographic analysis of the rainbow and remain blind to its beauty." Lucky are the biologists who, while scientifically measuring and observing the environment, can keep their eyes and minds open to the subtlety and beauty of the living canvases stretched and painted by Nature herself.

The bright, flashing silver of living fish, here a school of glassy sweepers, disappears when they die.



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The cry was: Go West, young man, and stay healthy

By Bil Gilbert

In the 1840s Americans by thousands headed toward the Great Plains, seeking not only land and gold, but also a cure for Great Pains

fact that conditions in the East tended to be so bad that many people desperately wanted to escape them."

Josiah Gregg is remembered as the author of *Commerce of the Prairies,* an account of his experiences during the 1830s as an early trader and traveler on the Santa Fe Trail. The book remains a primary historical document, and one that can still be read with pleasure, because Gregg was an intelligent, accurate observer with an easy literary style. But it is the reasons why he migrated that are especially instructive, since his motives were typical of many of those who pioneered in the West.

Gregg was born in Missouri in 1806. He grew into a sickly child whose survival was often in doubt. On the assumption that he was too frail to bear the hard work of the frontier, his family—which did well in farming and trade—encouraged him to read law. Gregg soon found he had little taste for it. Besides, he found himself sick so much of the time that he could not have practiced anyway.

By 1831, at age 25, he was virtually an invalid. His book describes the "morbid condition" that afflicted him. He was "so debilitated" that he could rarely walk "beyond the narrow precincts of my chamber. In this hopeless condition, my physicians advised me to take a trip across the prairies, and, in the change of air and habits which such an adventure would involve, to seek that health which their science had failed to bestow."

A carriage loaded with pills

Gregg immediately arranged to join a caravan then forming near Independence, Missouri, and bound for Santa Fe. He felt too poorly to walk far or sit on his horse, so he arrived at the rendezvous in a carriage, loaded with pills, powders and other "such commodities as I deemed necessary for my comfort and health." The assumption was that if he reached New Mexico at all, it would be in this vehicle, traveling more or less as a litter patient. After only a week on the trail, though, Gregg abandoned his carriage and medicines. Thereafter he rode a horse, worked, ate and slept on the ground just like the teamsters, traders and scouts of the caravan. "When we reached the buffalo range," he recalled, "I was not only as eager for the chase as the sturdiest of my companions, but I enjoyed far more exquisitely my share of the buffalo than all the delicacies which were ever devised to provoke the most fastidious appetite."

For the rest of his life, Gregg was healthy and vigorous. After nine years in the Santa Fe trade, he became a front-line correspondent in the Mexican War. In 1849 he took a troop of prospective gold miners overland to California. Gregg died of starvation early in 1850 while leading a party of explorers in the then unknown mountains of northern California. He was only 44, but his premature end was not caused by any constitutional infirmity.

Neither the doctors who originally suggested that Gregg take to the wilderness to cure his chronic ailments, nor the patient who accepted that advice, were unusual in the 1830s. As he wrote at the trailhead where his first Santa Fe caravan assembled, "The prairies have become very celebrated for their sanative effects. . . . Most chronic diseases, particularly liver complaints, dyspepsias, and similar affections, are often radically cured; owing, no doubt, to the pecu-

Illustrations by Arnold Roth

"After removing skull fragments, the physician proceeded to bleed his patient 16 times in ten hours."

liarities of diet, and the regular exercise incident to prairie life, as well as to the purity of the atmosphere of those elevated unembarrassed regions."

Gregg shared these opinions with a large number of men of letters who went West hoping to cure themselves. According to historian Archibald Hanna, one reason there are so many books about the West is that so many writers went West for the cure. An incomplete list of such authors, their ailments and works, includes: Washington Irving (nervous depression), *A Tour on the Prairies*; Francis Parkman (severe headaches), *The Oregon Trail*; Matthew Field (gastric ulcers), *Prairie and Mountain Sketches*; Lewis Garrard (general puniness), *Wah-to-yah and the Taos Trail*; William Hamilton (fevers), *My Sixty Years on the Plains.*

Though their testimonials helped to popularize notions about the remarkable curative effects of life in the far West, the notion of a healthy West was not the exclusive property of pallid young men with literary leanings. The belief was general among explorers, fur trappers, traders, miners, stockmen and covered-wagon pioneers—all classes, in fact, that took part in the westward migration. The truth seems to be that many pioneers thought of the whole trans-Mississippi country as a kind of miraculous, all-purpose spa full of restorative properties. The belief was particularly strong during pre-Civil War decades when most of the genuine pioneering took place. A compelling reason was the simple fact that conditions in the heavily-settled parts of the East tended to be so bad that many people desperately wanted to escape from them.

Except for a few scattered localities, health records were not generally kept until the latter part of the 19th century. But historians estimate the national life expectancy in 1840 at approximately 39 years—about 30 fewer than it is now. The mortality rate in the large cities, about 30 deaths per year per thousand, was more than three times higher than today's.

Early 19th-century Americans suffered from all our current afflictions, plus a great number of lethal and disabling ills since eliminated or reduced to minor problems. They were commonly laid low by cholera, diphtheria, lockjaw, rabies, smallpox and typhus, not to mention milk fever, the mysterious disease that killed Nancy Hanks Lincoln. Not until this century was it discovered that milk fever was caused by cows feeding on white snakeroot and other plants containing the toxin tremetol.

At a conservative estimate, well over half the population south and west of New England probably suffered at one time or another from malaria, then commonly called "the ague." Entire families, and even communities, were sometimes laid low with malarial chills and fevers, headaches, nausea and exhaustion. In Indianapolis in 1822 it was reported that out of a population of 1,000, some 900 people were shaking with the ague. The next year, 90,000 of the 165,000 settlers in the 17 counties around Columbus, Ohio, had malaria. A Kentuckian, who had been driven out of Missouri by the fever there, met another health seeker on the road who was headed toward the town of Boone's Lick for safety, and tried to discourage him: "The people die there like rotten sheep. They have filled one graveyard already and have begun upon another. Well, go on, but I can tell you, *you will shake*!"

By 1830, the U.S. population had tripled to 13 million—nearly all of it still east of the Mississippi. During the same period, medicine, and the techniques for disposing of waste and protecting the purity of food and drink, improved very little. In the cities more and more people lived in closer quarters. Bad air, water,

The author, who lives in Arizona, writes often for SMITHSONIAN *and has just completed a biography of Mountain Man Joe Walker titled* Westering Man.

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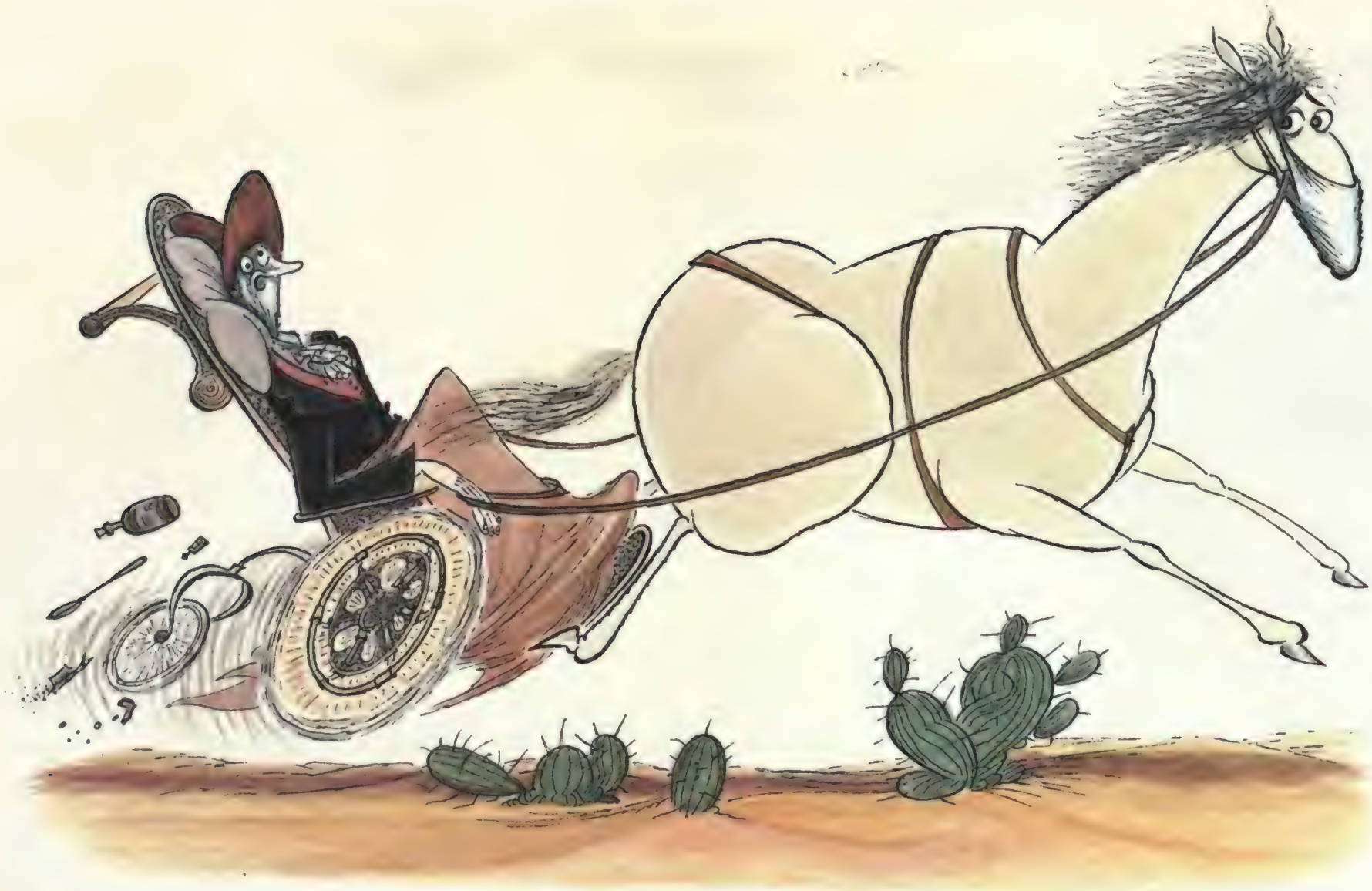


"The assumption was that if he reached New Mexico at all, it would be in this vehicle as a litter patient."

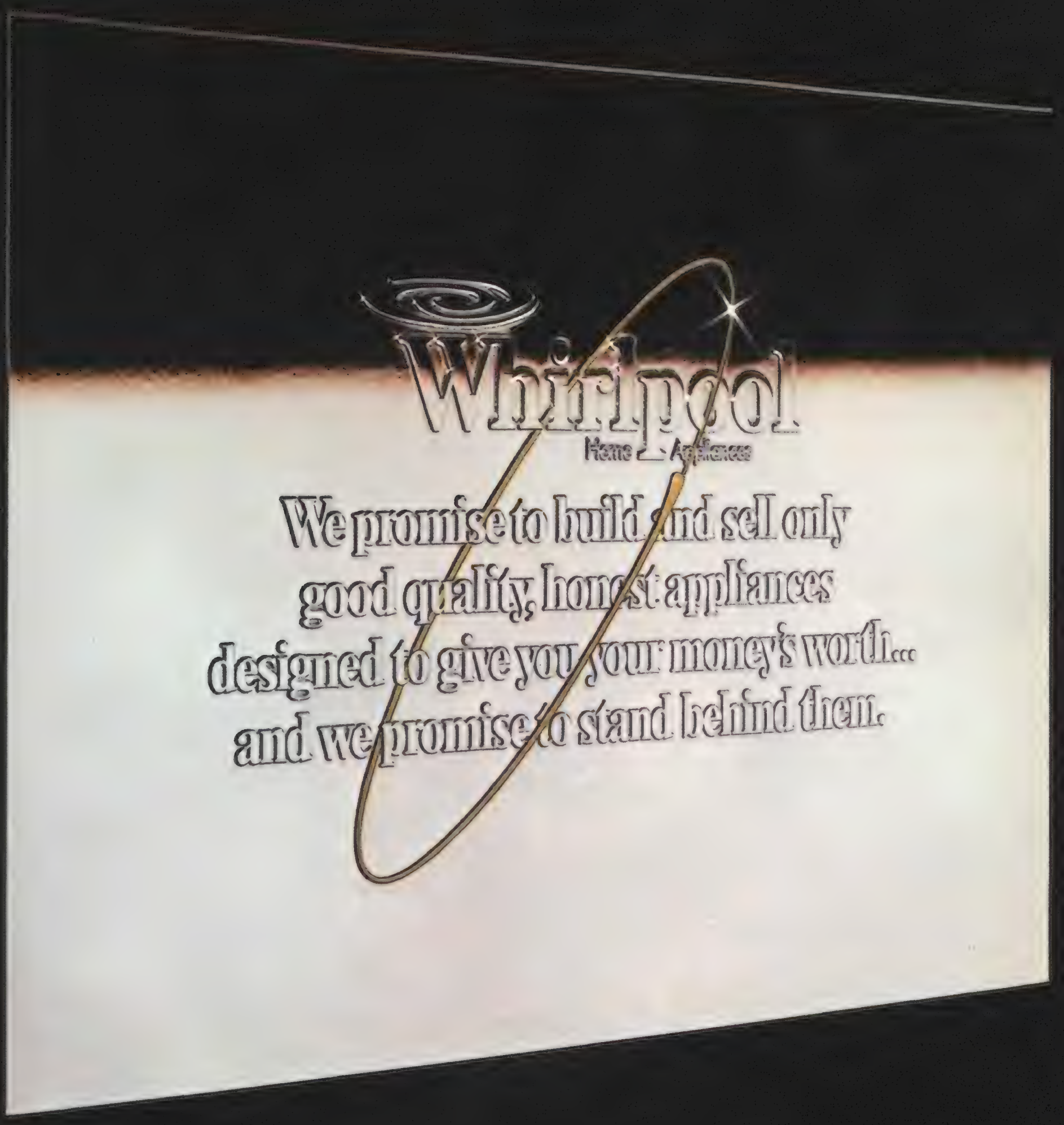
food and filth diseases became chronic plagues. With the advent of the Industrial Revolution conditions worsened. Suggestions that employers or communities had some legal or ethical responsibility for the health and safety of employees or citizens were generally regarded as subversive. The occupational accident rate was high, often with gruesome results. Such antique-sounding but serious ailments as brass-founder's fever, hatter's shakes and file-cutter's paralysis were common among working people. The term "mad as a hatter" had its origin in a real neurologic disease caused by mercury poisoning.

Wealth increased steadily although, paradoxically, much evidence suggests that dietary standards declined. Out of necessity colonial families often foraged for wild foods, and so fed on fresh meat and vegetables. By 1830 supplies of such foods, as well as the taste for them, had decreased in many localities. Meals were monotonous and often non-nutritious. Coastal residents were more sophisticated, and had easier, cheaper access to varied foods. But the standard fare of inland Americans was corn and hog meat. The former was ordinarily served as mush, grits or bread; the latter was salted. Everything that possibly could be fried *was* fried, and in lard. "I had never undergone such gastronomic privations as in the western [i.e., the present Midwest] parts of America," wrote German Prince Maximilian of Wied-Neuwied in 1843. Maximilian was an early naturalist (SMITHSONIAN, October 1976) and one of many foreign travelers who complained about American food.

The quality of the grub may have been bad, but the quantities put away were impressive. "Americans," journalist Robert Tomes admitted in an 1856 issue of *Harper's Magazine*, "are not epicures, but gluttons. They swallow, but don't eat; and, like the boa constrictor, bolt everything. . . . It startles a foreigner to see with what voracity even our delicate women dispose of the infinite succession of dishes on the public tables."

An early report in the *Medical Repository*, a principal journal of the day, commented on the national eating habits: "The inhabitants are almost constantly in a state of repletion, by stuffing and cramming, and by the use of stimulating drink. The consumption of animal food is probably much greater in the Fredonian [United] states, than in any other civilized nation. . . ."

If anything, Americans drank worse than they ate. Coffee was dear. So was tea. Besides, in the early days, it was scorned as British and therefore unpatriotic. With good reason both milk and water were commonly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suspected of being contaminated or outright lethal. The most popular alternatives in early 19th-century America were corn whiskey and hard apple cider. In his excellent study, W. J. Rorabaugh speculates that the unsavory general diet probably had something to do with prodigious boozing. Only raw whiskey, he reasoned, could cut through the layers of grease that coated American palates. Many Americans drank morning, noon and night and paid for it with dyspepsia, liver and bilious complaints, delirium tremens, terrible hangovers and other forms of crapulence.

Dr. Daniel Drake, probably the most prominent physician west of the Appalachians in the 1830s and '40s, suggested that even more bizarre consequences resulted from the obesity and drunkenness of his countrymen. Reporting to a professional meeting, Drake said he knew of several cases in which fat men had so stuffed themselves with grease and alcohol that they became literally flammable and had more or less exploded when sparks from a fire fell on them. He described the phenomenon as "spontaneous combustion."

Physicians were often part of the health problem. The first half of the 19th century was a time of total medical chaos. Homeopaths, "hydropathists, botanics," allopaths fiercely contended with each other, usually to the detriment of the patient. The dominant school of medicine was still the "heroic" one, the term applying to the theory of treatment rather than to the character of the practitioner. Doctors regularly administered massive doses of drugs—quinine and calomel being the favorites—and practiced bleeding on a grand scale.

The official aim was to relieve "inflammation," but the technique was usually used with little or no relation to the disease. In 1806, for example, a man named John Shaw, trying to sink a well in Knoblick, Kentucky, accidentally blew himself up with blasting powder. When found, Shaw was covered with dirt, had lost several fingers, and suffered fractures of the leg, arm and skull. Through the latter, brain matter oozed. After removing some skull fragments from the wound, the attending physician proceeded to bleed his patient 16 times in the next ten hours. Shaw, if not his doctor, seems to have been a hero, for he survived.

There were, of course, competent and compassionate individual physicians, among them Daniel Drake, despite his odd notions about spontaneous combustion. But there were so many quacks that, cynics suggested, one of the best reasons for migrating to the trans-Mississippi country was to escape the clutches of the medical profession. When you added to that the growing suspicion that some of the worst scourges might be connected with heavily settled places and the style of life in them, seeking a cure by migrating to the unsettled West made good sense.

Malaria may have had more direct influence on the westering movement than any other single disease. Although quinine was available by the 1820s, treatment for malaria was not really effective until much later. In the 1840s a professional colleague practicing in Louisiana wrote Drake that during an outbreak of ague in that city he had drawn "blood enough to float, and given calomel enough to freight, the steamboat *General Jackson*." Since it was common knowledge that malaria (mal-aria from "bad air") was prevalent in wet, fetid, low-lying areas, an obvious thing to do was to get out and find higher, drier ground and sweeter air. People who fled the swampy bottomlands to escape the ague (as well as all that bloody medical attention) almost invariably moved West toward new and perhaps healthier land.

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"Despite herbal cures, medicine men could do little to help people with no immunity to European ills."

the healthfulness of their regions. In the late 1830s boosters in then "frontier" Wisconsin claimed physicians had found their territory "distressingly healthy." Before malaria spread there, along with a heavy influx of settlers, Missouri was extolled as a place where undertakers had to shoot and kill to get customers. Antoine Robidoux, a Rocky Mountain trapper and trader in the 1820s and '30s, became interested in guiding emigrant parties to California. Trying to drum up more trade he blithely told prospective pioneers that "there was but one man in California that had ever had a chill there, and it was a matter of so much wonderment to the people of Monterey that they went eighteen miles into the country to see him shake."

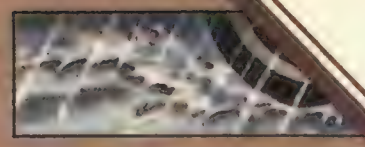
Whether they liked it or not, early travelers in the West were treated with buffalo meat—a specific as highly thought of as mung-bean sprouts are today. Frontiersmen ate buffalo regularly, up to 15 pounds per sitting. It was said among them that if a man "could eat buffalo all his days he need never go under," i.e., die. The custom was to consume peculiar parts of the buffalo, including the hot blood, raw liver and whole intestines, all good sources for vitamin C. These eating habits may help to explain why, though the early mountain men and plainsmen were almost exclusively carnivores, they seldom suffered from scurvy.

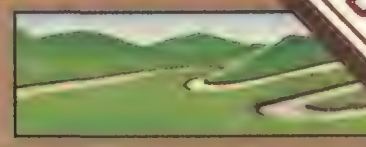
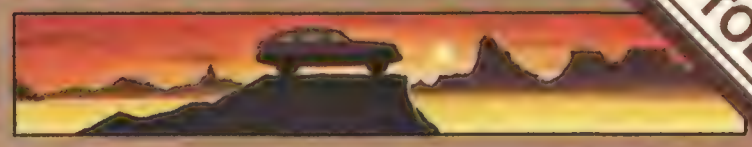
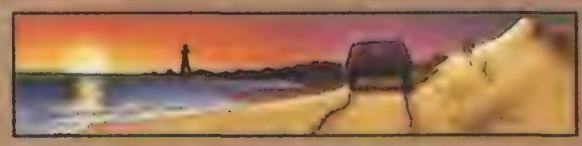
Rufus Sage, a young Connecticut man, went West in 1841. He was sickly and yearned to write a book. A few years later he turned out *Rocky Mountain Life: or, Startling Scenes and Perilous Adventures in The Far West*. Sage spent several years living as a genuine mountain man and enthusiastically described the taste and tonic effects of buffalo: "The agreeable odor exhaled from the drippings of the frying flesh, contained in the pan, invited the taste. . . . Catching up the vessel, a testing sip made way for the whole of its contents, at a single draught—full six gills! Strange as it may seem, I did not experience the least unpleasant feeling as the result of my extraordinary potation."

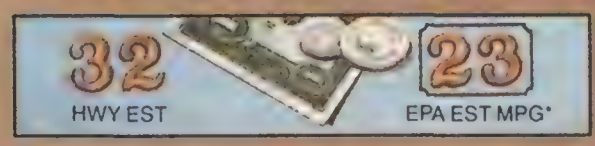
The stomach, he continued, "never rebels against buffalo-fat. . . . And then, in point of *health*, there is nothing equal to buffalo-meat. It, alone, will cure dyspepsy, prevent consumption, amend a broken constitution, put flesh upon the bones of a *skeleton*, and restore a dead man again *to life*!—if you will give credence to one half of the manifold virtues he [the voyageur] carefully names in your hearing."

Whether or not it was because of their "buffler" buffets, the mountain men were among the most durable and romantic figures in the pantheon of native

FOR THE WET
FOR THE WHITE
FOR THE WINDING
FOR THE WILD
FOR THE WARM
FOR THE WEEKEND
FOR THE WALLET





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heroes. In their own time they were great celebrities, admired for their physical prowess, who served as living advertisements for the virtues of Western life. George Catlin, perhaps the most talented and widely traveled of early frontier painters, noted that in the 1830s he had met hundreds of mountain men who "lived exactly upon the Indians' system, continually exposed to the open air." He added that never in his life had he seen "a more hardy and healthy race."

Maybe the healthiest of all mountain men was Joe Walker. Coming out of Tennessee to Missouri in 1819 as a teen-age veteran of the Appalachian Indian wars, he roamed the West for 50 years as trapper and surveyor. Walker was the first to lead an overland party to California through the Sierras. He brought the first wagon train to the state and led the first settlers into central Arizona through the Apache territories. In the 1840s when the covered wagons began to roll in earnest, Walker was so celebrated that meeting him was considered an event worth noting in diaries and letters back home. When Walker was in his fifties, Richard May of Missouri reported: "Mr. Walker steps with the elasticity of a youth but this much may be said of any one that has lived in these mountains a few years."

In LeRoy Hafen's monumental study, *The Mountain Men*, Richard J. Fehrman contributed an essay dealing with the vital statistics of 292 mountain men who constituted more or less the crème de la crème of this class. Their average life span, he found, was 64 years, 22 years more than the national average in their own day and only a few years short of the current life expectancy for American males. Of course, comparing mountain men with the hordes of emigrants who followed them West is a bit misleading. The emigrants were householders, including some children and old people, many of them ailing in the first place, while the mountain men knew the land, lived alone or in small bands, and were rarely exposed to contagious diseases. They were also sheltered involuntarily from one of the most common afflictions of other men—drunkenness. Except for one hell-roaring drunk a year, when they came in to sell their furs, they lived in places where booze was extremely scarce, and what they drank they had to pack in with them.

Thousands of westbound travelers, seeking health or wealth or a new life, were willing to suffer on the road. Indeed, it took a brave family to make the attempt. But even as regards those hardships, especially the Indian slaughters that figure so heavily in books and films, the way West appears to have been a good deal healthier—and a good deal less lethal—than we presently suppose.

In his definitive study of the overland migration, *The Plains Across* (SMITHSONIAN, June 1979), John Unruh concluded that during the 1840-60 period, when most of the wagons rolled, an estimated 10,000 migrants out of some 300,000 died from all causes. Admittedly, the pioneer companies were largely made up of adults who were usually on the trains for only three or four months. Nevertheless, their mortality rate while actually making the crossing was far lower than the national average at that time.

Medically speaking, it was the Indians who suffered most from the arrival of those pre-Civil War wagon trains full of Eastern health seekers. Indian doctoring was based on herbal cures whose effectiveness modern science is only now beginning to understand and credit. But Indian medicine men could do little for a people with almost no immunity to European diseases. Not merely smallpox and cholera, to which white men had by then developed some immunity, as well as some medical skill in handling, but simpler ills like measles and the common cold often helped lay the Indians low. It was not surprising that by 1850, as Unruh wrote, "A Fort Laramie observer reported that frightened natives were deserting the [wagon] trails in hopes of avoiding the deadly peril."

In that connection, Unruh also made another statistical discovery that tends to astonish those who share the common vision of Western wagon roads littered with burning prairie schooners and white bodies stuck full of arrows. After sifting through the tall tales, he estimated that from 1840 to 1860 the deaths of only 362 of the 300,000 overland emigrants could be attributed to Indians. At that rate, murder and mayhem were surely less common along the Western trails than in the Eastern settlements—then or now.

By 1850, observers reported, "frightened natives were deserting trails in hopes of avoiding deadly peril."

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Neither jet fighters nor arrowheads, these formations provide a real service for the owner.

By Roger S. Johnson

It makes one dandy package—even if it's only skin deep

Form follows function at every level of life, including those the eye cannot see. Can you discern the purposes behind these structures?

Photographs by Wolf H. Fahrenbach

The battery of lethal-looking projectiles on the preceding page is in fact the skin of a shark, seen through a scanning electron microscope. This and the other pictures shown here, taken at magnifications of 120 to 10,000, suggest the remarkable variety of the tough envelope that surrounds all vertebrate creatures. We can move because our skin protects our insides from contact with our surroundings. Our skin shields us from abrasion and guards us against the invasion of bacteria and excessive loss or gain of heat and water.

Fine structure increases or reduces friction

Skin structures have evolved to facilitate the movement of animals, such as swimming through water, springing into the pond, slithering across the ground or flying through the air. An animal's shield stretches and conforms to the motion of muscles and bones while it influences speed and traction. The treadlike pattern of cells on a frog's footpads helps it to cling to leaves and twigs (p. 153). The shark's triangular scales disrupt the water around it, decreasing drag and enabling the shark to swim more easily. The sole's whorled ridges anchor mucus, protecting the fish against the loss of its lubrication (p. 154).

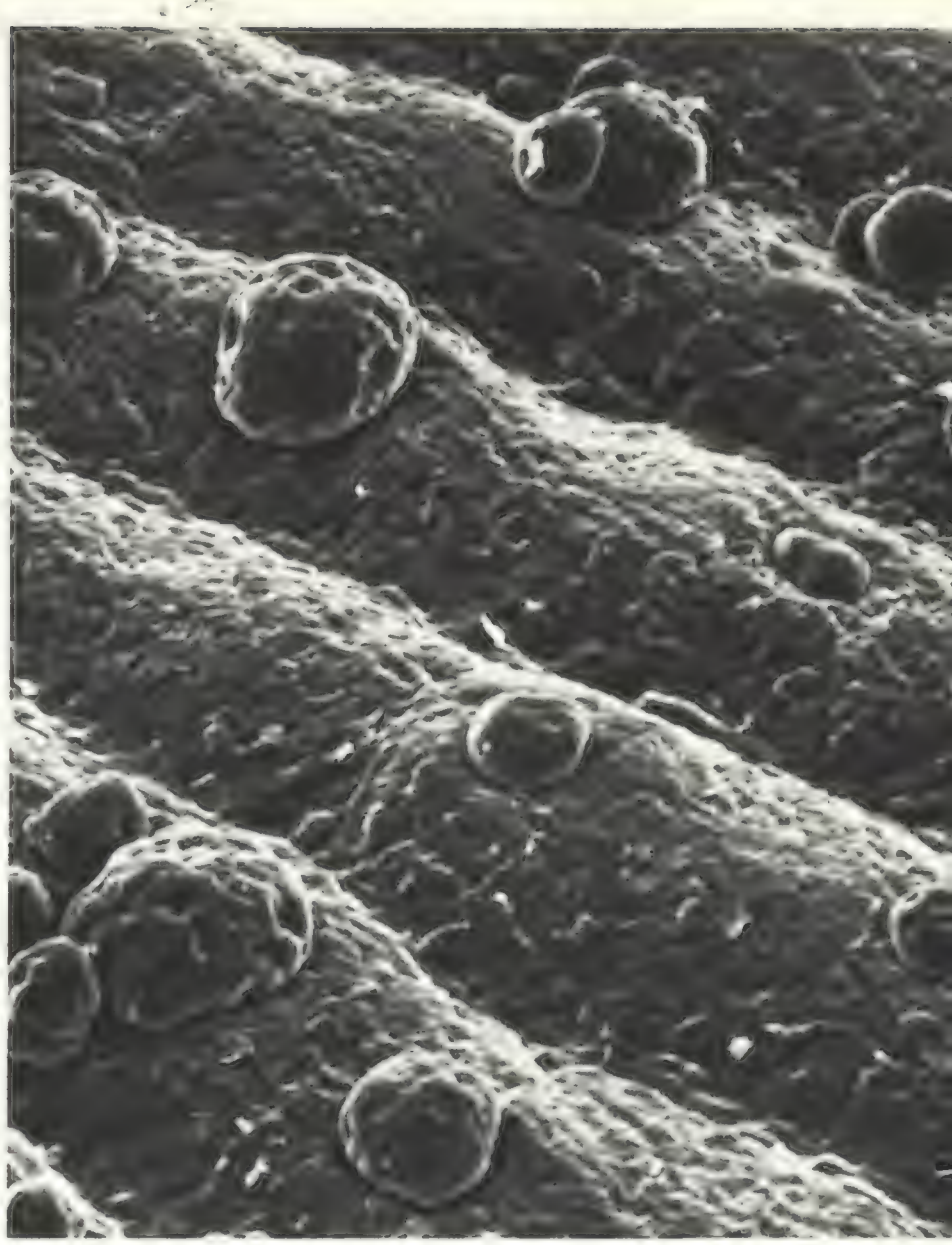
Moving from water to land, vertebrates evolved a new, more complex skin, principally to keep them from drying out. Nevertheless, amphibians still must stay close to water. Some terrestrial amphibians, such as the toad, developed thickened skin that facilitated their adaptation to land. But many terrestrial amphibians must return to the water to reproduce, and they still can dry out rapidly. Reptiles broke completely from dependence on water—they do not have to live in or near it to survive. Their armor of horny epidermal scales (right) reduces water loss.

Birds fly with the help of highly modified skin structures. Their feathers are elaborations of skin but do not cover the birds entirely. The legs of most birds are covered with scales made of keratin (p. 153).

The surface of mammals' skin consists of layers of dead cells that appear relatively uninteresting under the microscope. However, some mammalian skin cells, if kept moist and rubbed continually, as on the cow's snout (p. 153), show uncharacteristic detail.

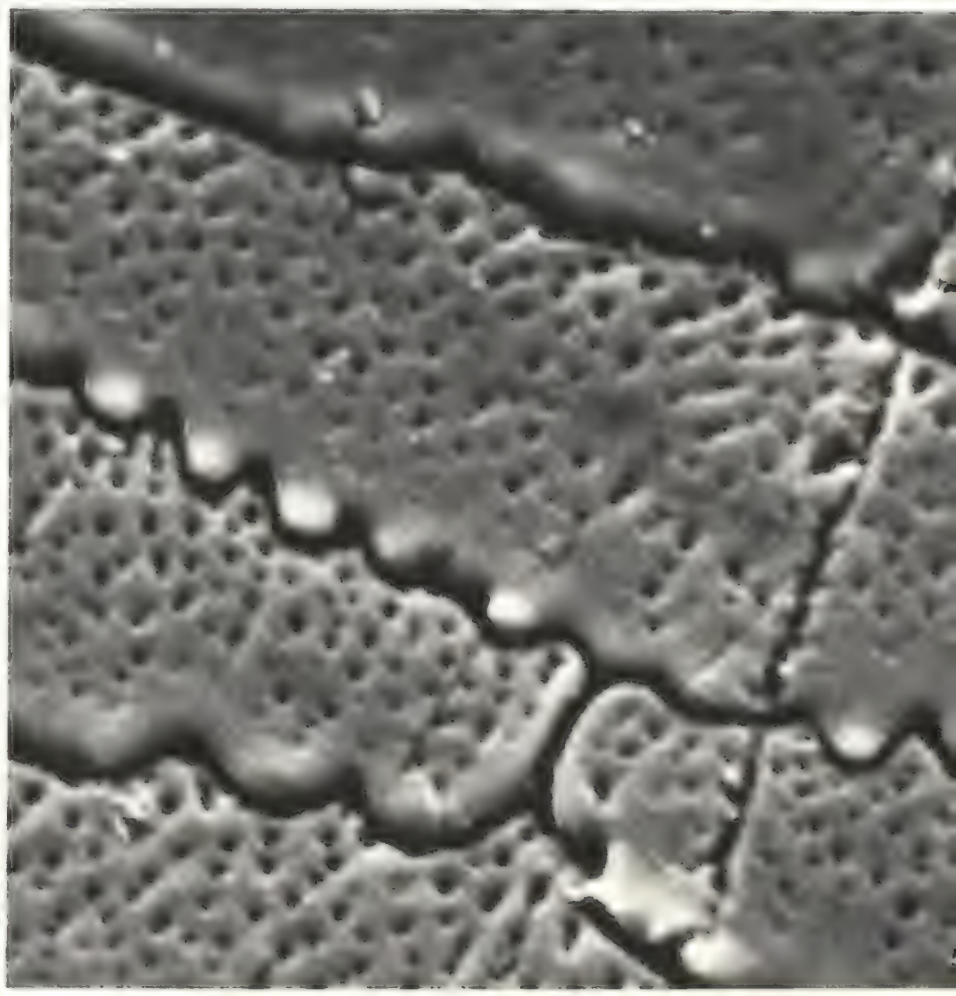
Human fingerprint ridges bulge from the dermis (above). Overlying the dermis, the epidermis pushes out layers of flattened cells that eventually are rubbed off by friction with the environment. If skin is protected from frictional wear, as on the guinea pig's ear (p. 153), dead cells stack up like a scaly undergrowth. Such dead-cell layers shield land vertebrates from ultraviolet light, bacteria, heat and water.

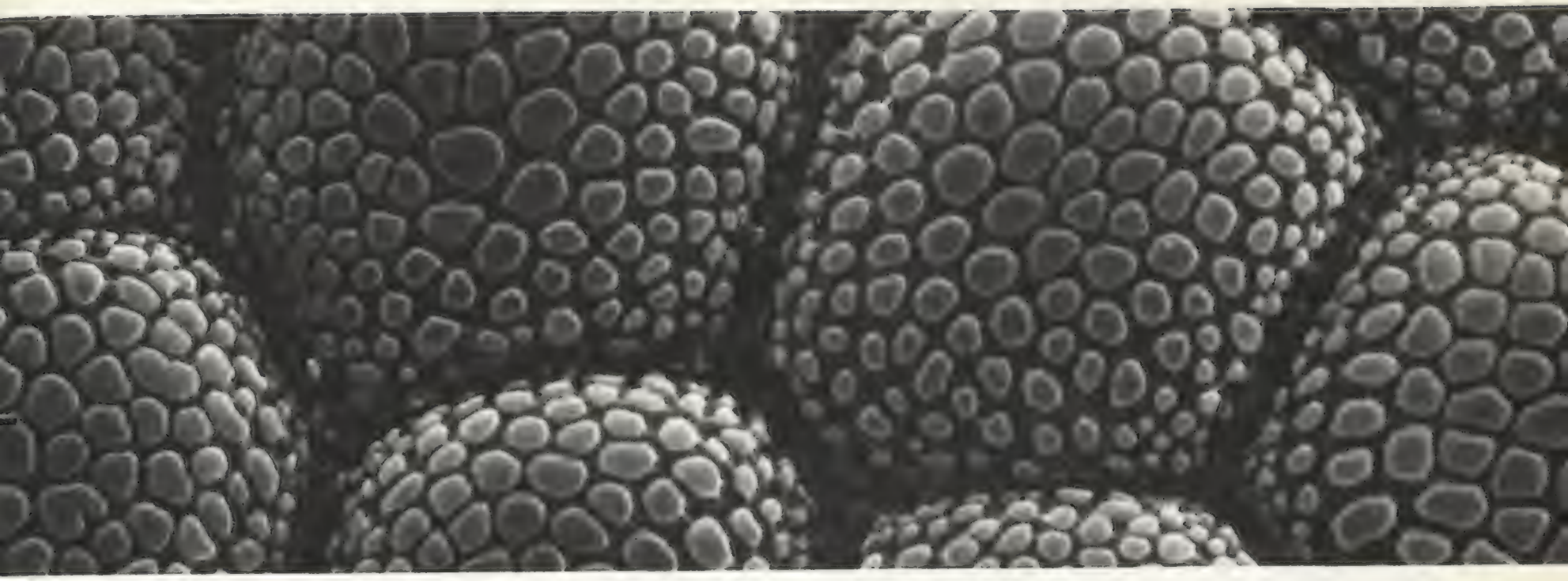
Our skin is life-sustaining; we could not leave home without it.



Beads of perspiration nestle in sweat glands along the ridges in this cast of a human fingertip.

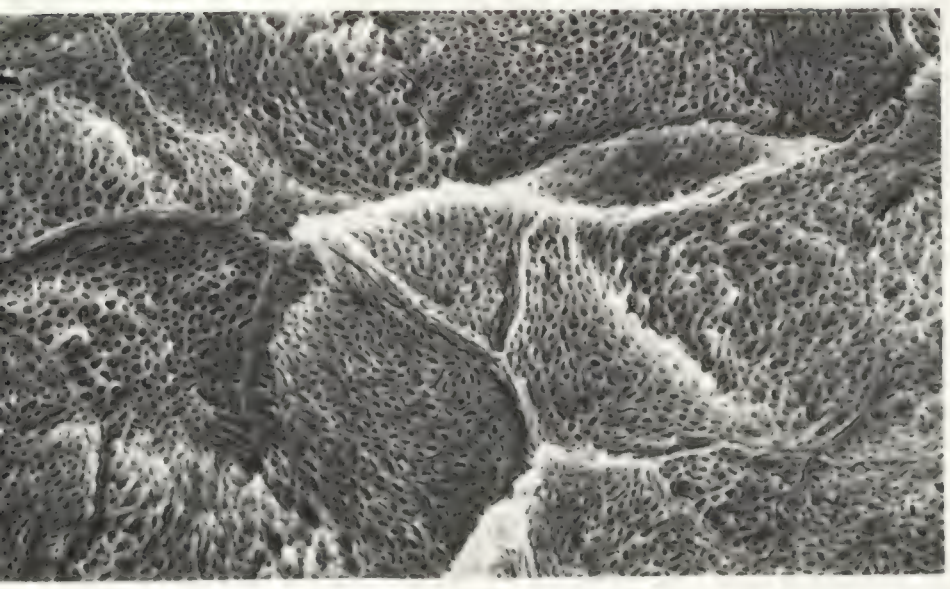
Pitted shingles like these formed from dried cells cover the scales on the head of a garter snake.





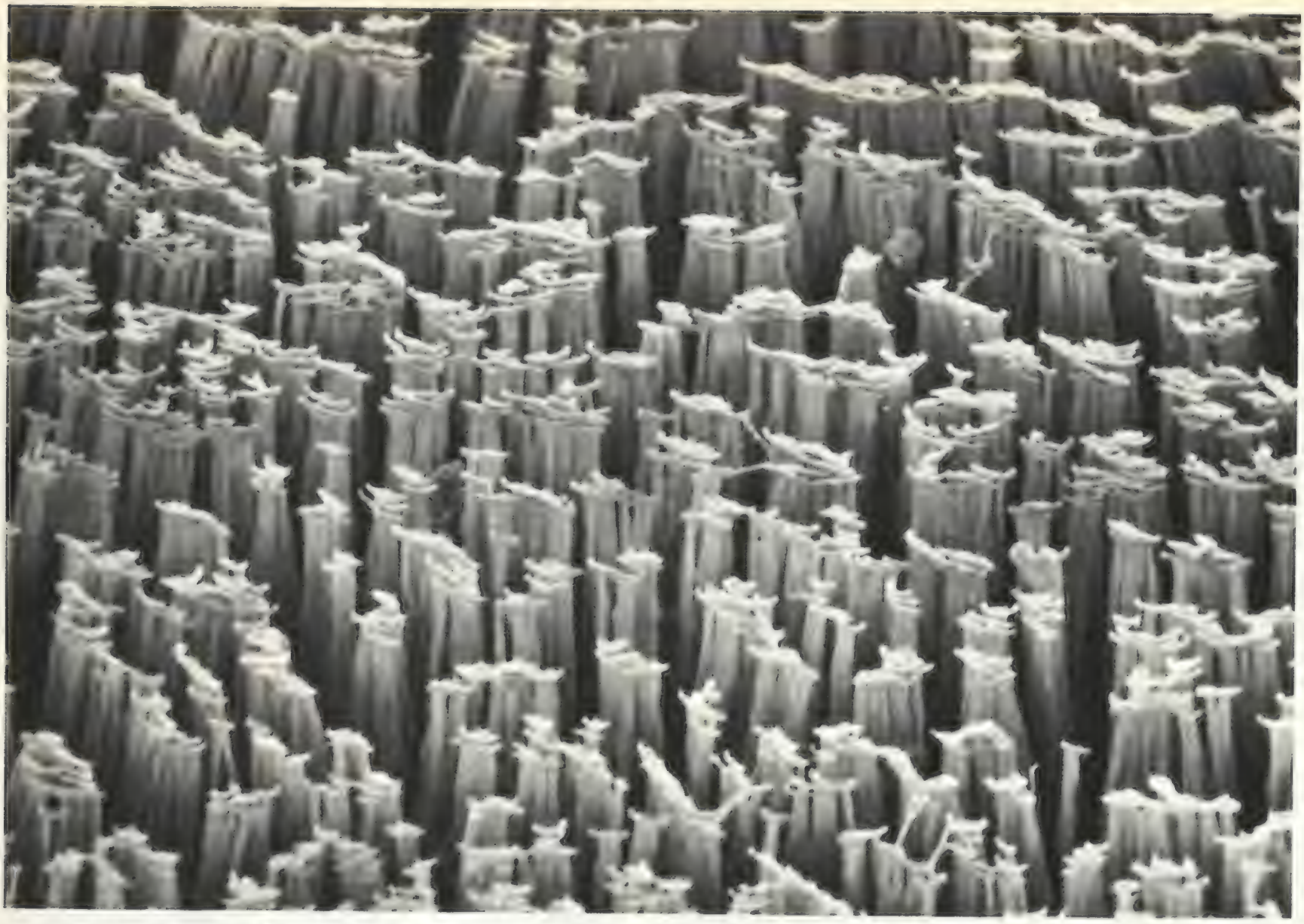
A frog's toe pad features raised hexagonal cells that perform the same function as rain tread on a tire.

In guinea pig's ear, fine hairs grow out through a layer of dead cells. No friction wears them away.



A cow's snout shows interlocked cells that have been deeply sculptured by moisture, abrasion of grass.

A chicken leg with keratinous flakes, made of the same material as are the bird's beak and claws.



An American lizard, the green anole, uses these bristles on its toes to scamper up vertical surfaces.

Ridges on scales of a sole ordinarily anchor mucus that eases the fish's movement through the water.

Living well is the best revenge.

B and B

The drier liqueur. Imported from France.

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By William Weber Johnson

Trying to solve the enigma of the *Sierra Madre*

As adventurer Dobbs in film of *Treasure*, Humphrey Bogart hides from *bandidos* intent on robbing him.

For years journalists and 'professorial paparazzi' have sifted clues to the identity of the author of a famous novel that became a legendary film

He changed his name as frequently as chronic worriers change their minds. He made up names for himself as an actor, journalist, short-story writer, novelist and citizen of the world. He invented characters with names like Bogumil Schiebenkleben and Pguwlkschrj Rnfajbzxlquy.

He flirted with his future wife in his role as a professional photographer. She didn't see him again for some years, but was aware of him under another name with another profession. Then she met him again as a screenwriter and married him under a third name. She called him Hal. On their honeymoon she heard an old friend call him Paul. On trips together he liked to sign hotel registers with fictitious names. He suggested she assume the name Carmen, which bore no resemblance to her true name.

Arnolds, Barker, Becker, Croves, Feige, Gaudet, Kraus, Lainger, Martinez, Marut, Maruth, Mareth, Maurhut, Ohley, Raederscheidt, Schneider, Terlelm, Torsvan, Wienecke—all these names and others were used by him or in one way or another were associated with him. He was alleged to be German, Lithuanian, Scandinavian, English, American, Mexican, and had claimed to be a seaman, soldier, bookseller, agent, nut grower, translator, mechanic, baker, journalist, photographer, pest eradicator and explorer. Few criminals have used so many dubious identities.

He was not a criminal but was, instead, an internationally eminent figure in the literary world. Some 25 million copies of his books have been printed in 500 editions and 30 languages. But, oddly, he led a compulsively secret life, avoiding public attention as avidly as most writers pursue it. Publishers of his books knew little about him. He refused to provide photographs for publicity or facts or fancies for dust-jacket blurbs. Even close friends were kept at arm's length. Some who had known him first under one name and then another learned not to question his identity, not to refer to the past. The most familiar of all the names is the one that appears on most of his books: B. Traven.

The name is more widely known in Europe than elsewhere. In the United States he is, thanks to television reruns, known mainly as the author of *The Treasure of the Sierra Madre*, the classic film by John Huston, with Humphrey Bogart as a down-and-out adventurer. This was made from one of the dozen novels bearing the Traven name—stories dealing with wanderers, workers, sailors, soldiers of fortune, insurrectionists, Mexican Indians and idealistic anarchists. In *Treasure* and his other better-known novels, *Death Ship* and *A Bridge in the Jungle*, Man is portrayed as a victim of a money-mad society. Conservative folk consider him a radical, against capitalism, against government of any kind, while radicals tend to regard him as an undisciplined deviationist.

In bust for writer's Mexico City garden, sculptor Federico Canessi captured secretive air of his subject.

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There is general agreement that he was an excellent storyteller, although his philosophical digressions frequently blunt the impact of the story. Whether he was a great writer whose words will live cannot be foreseen; preoccupation with his identity and the puzzles of his career receive more notice than his literary worth.

But within the academic and publishing worlds he is something of a cult figure. Recently, an international and interdisciplinary conference commemorating the presumed 100th anniversary of Traven's birth convened at Pennsylvania State University. Scholars and writers from eight countries attended and presented papers in both English and German. There were authors of books, articles, critical studies and monographs, and it was clear that many more are in the works. Travenism has become a growth industry in academe. A call has gone out for Traven papers to be presented at the next annual meeting of the Modern Language Association.

The Traven experts at Penn State appeared to regard each other with a sort of good-natured and genteel suspicion, sniffing the air for fresh scents of discovery, understanding or insight. There was no outright quarrel but there was sharp disagreement on two major points. One had to do with language. Did he write in German peppered with Americanisms? Or in English with German constructions—diving into a sentence and disappearing, as Mark Twain put it, to emerge on the other side with the verb in his mouth? Because of the complicated migrations his work made through the hands of translators and editors, these studies may go on forever.

The other great and perhaps more abrasive question is, to put it simply, whether works bearing the name B. Traven are the output of one man or two, or maybe even more. The latter view is put forward by Professor Michael L. Baumann of California State University, Chico, author of one of the most comprehensive and analytical books about Traven. The opposing view—one man, one byline—is held by Professor Karl S. Guthke of Harvard. No resolution is in sight, but, as Guthke points out, it keeps the "academic police and professorial paparazzi" busy.

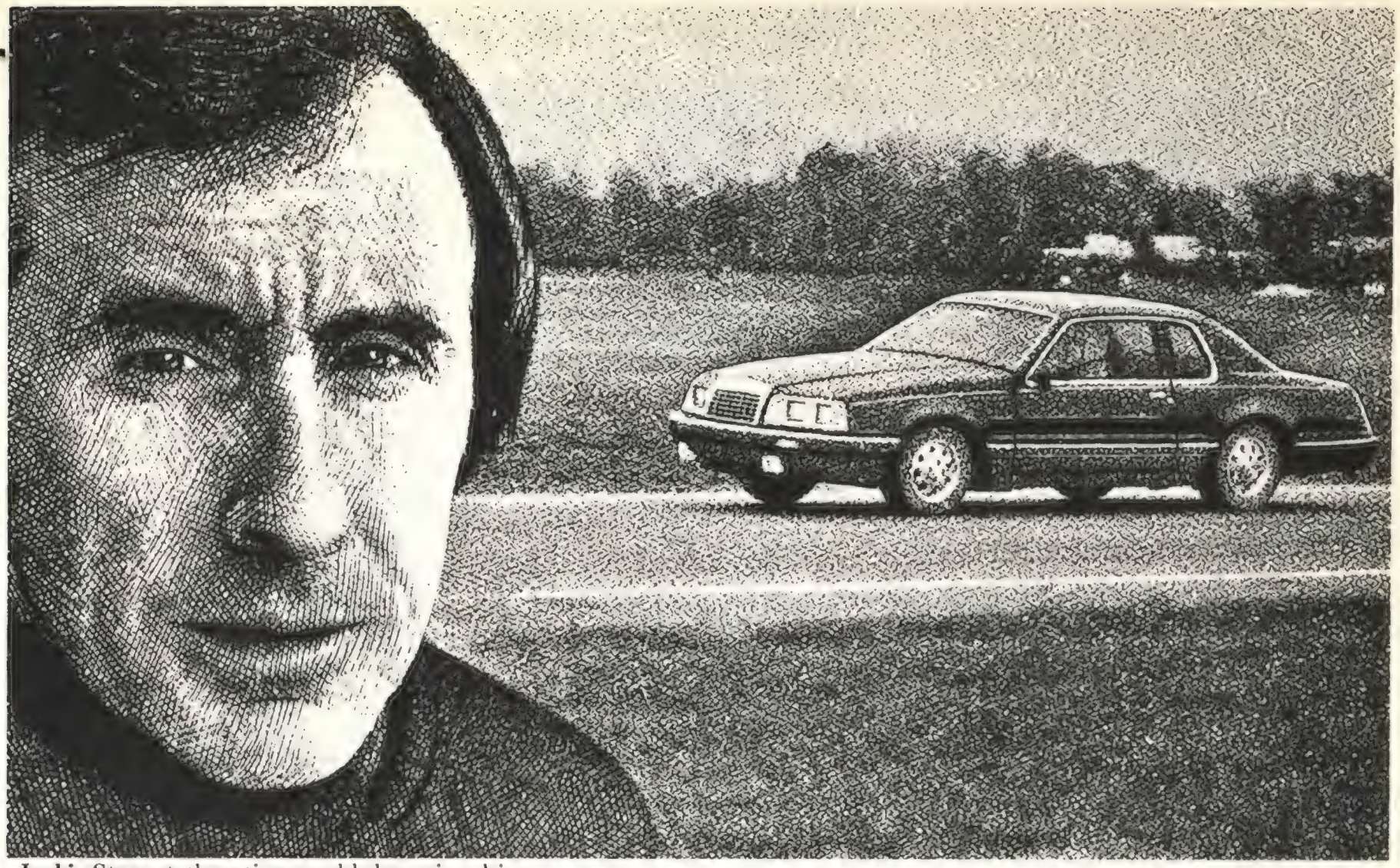
Traven's best-known book has appeared in 500 editions, 30 different languages.

Not even Traven's widow knows all the answers. The last 17 years of his life were spent with her and it apparently was a true love match, despite more than a 30-year difference in their ages. Only little by little did he permit her, a proud and intelligent woman, to penetrate some of the secrets of his life. At his death she still subscribed to his claim that he was a native of Chicago (no birth records can be found there or in San Francisco, which he also claimed).

One who had known the man, as I had, could not help wondering what Old Whatshisname, with his addiction to privacy and his skill at spinning puzzles, would have thought of such a conference.

I became involved with him quite

Mr. Johnson, a free-lance writer in San Diego, is author of Heroic Mexico, *a book on the 1910 revolution.*



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A few hints

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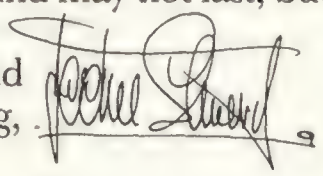
Light at the end of the tunnel

Words written on the wind may not last, but I have a feeling that cars designed in the wind will be with us for a long, long time.



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TIMBERPEG

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by chance. After World War II, I was working as a newsman in Mexico City. Mexican journalists and writers began showing up in my office wanting to claim a prize of $5,000, supposedly offered by one of my magazine employers for information on the identity and whereabouts of the mysterious novelist, B. Traven, then thought to be somewhere in Mexico.

I had read two of Traven's novels, *Treasure of the Sierra Madre* and *Death Ship*, and was in the middle of *Una Canasta de Cuentos Mexicanos*, a collection of short stories just published in Mexico. But I knew nothing about the author other than his quality as a storyteller and his admirable avoidance of the limelight.

I told these would-be informants that there was no such reward. Still others came with their revelations. Traven was a beachcomber at Boca del Rio, below Veracruz. He was working as an oilfield roughneck in Tabasco. He was a rum-soaked derelict in a waterfront bar in Tampico. Finally, curiosity led me to the door of Esperanza López Mateos. She was the Spanish translator of *Una Canasta* and, it turned out, Traven's Mexican agent. I later was told that their relationship was not solely business. A handsome blonde lady, she was the sister of Adolfo López Mateos who would later become president of Mexico. I told her that I had no intention of trying to violate the privacy to which Traven seemed so dedicated. But I thought there might be a short magazine piece in all the strange stories surrounding the man.

She agreed and added some that I had not heard: that the name was used by a stable of expatriate writers in Central America; that she herself was Traven; that her brother was. She was most cordial and gave me a cup of good Chiapas coffee. Part of the house was partitioned off by heavy draperies, and although I saw and heard nothing, I had the feeling there was someone behind them during our conversation.

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A while later a strange document arrived by mail. It was typewritten, single-spaced and 25 pages long. It began: "This material has been written and prepared by whom B. Traven at present and for some time still not around calls his 'filing cabinet.'" This bizarre style cropped up throughout the document. Although the prose of the Traven books I had read was sometimes rough, it was not this rough; presumably, editors had cleared away some brambles. There was, nevertheless, a ring of authenticity, a combination of irony, wry humor, preachiness, crankiness, didacticism and impatience with constituted authority that convinced me it was the work of Traven.

The letter contained some additions to the Traven myths. "There have been people in the U.S. who insisted that he is a Negro, others that he is a woman. In Germany papers printed stories that he was one of the Hohenzollern princes who had emigrated and were [sic] living incognito in Mexico. . . . German reporters claimed to have met him simultane-

Esperanza López Mateos was Traven's friend and Mexican agent in late 1940s.

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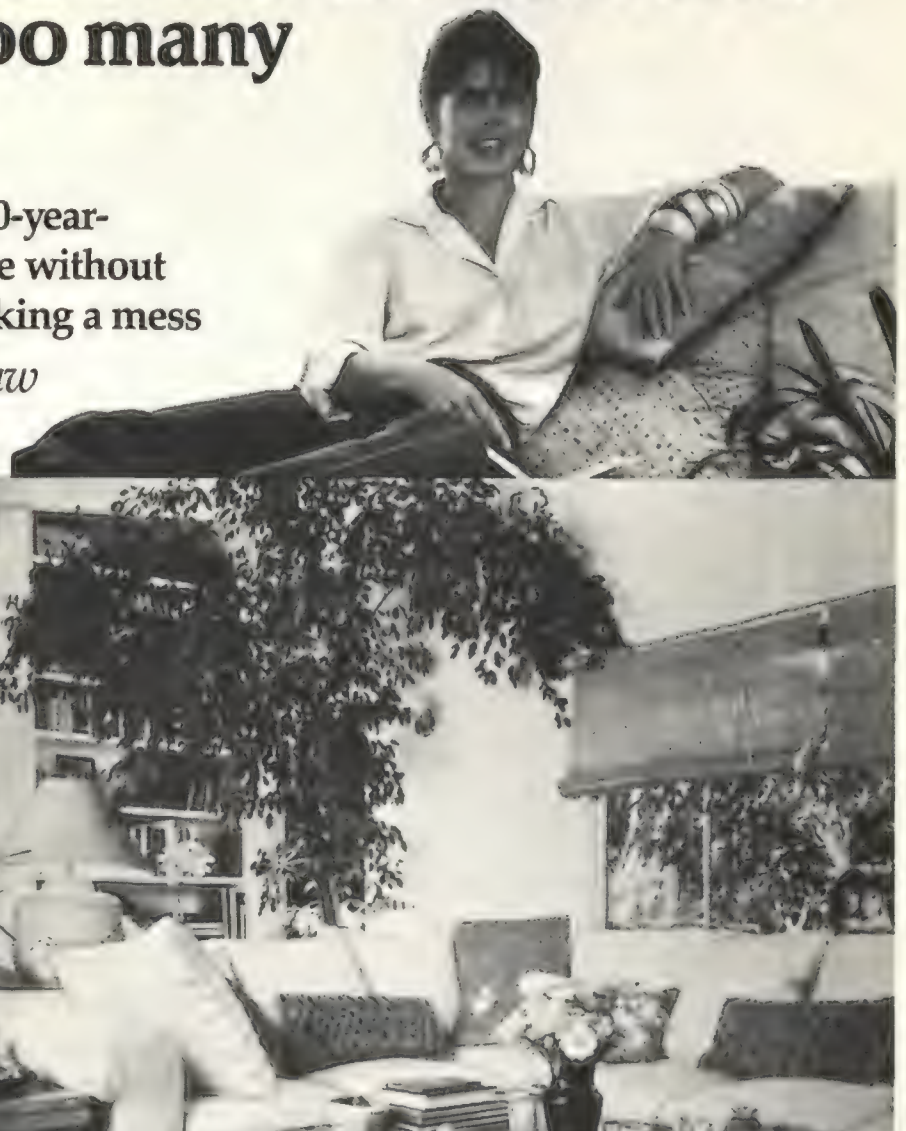

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He also acknowledged the rumor current in Mexico that Esperanza López Mateos was in reality Traven: "Let Miss Mateos have all the honors. . . . My best wishes for Miss Mateos, one of the finest and noblest ladies."

I suspected that in a spirit of enthusiastic cooperation the author had made up some new myths to go with those I had already collected. He went on to express his anger with those who insisted his first name was Bruno, but gave no hint as to what the initial "B" stood for. He seemed even angrier with those who identified him as a German. He was, he insisted, a native of the United States who wrote in English; then, unable to find an American publisher, had his books translated into German, published in Germany and other countries. The attribution of German nationality came from "super patriotic" German critics. "Whoever has read any of my books in earnest cannot be in doubt of my nationality, and if he should remain doubtful I don't give a damn."

There was candor. He acknowledged the roughness of his prose: "On reading Traven one will find it sometimes not very easy. His style, his way to express himself is now and then clumsy, cumbersome, twisted, mangled and his English will frequently shock men and women of culture, although the ideas he wishes to drive home . . . are always clear. . . . One must not forget that he has been a sailor for many years, that he has had to earn his own living . . . since he was seven . . . until he was 35 . . . had

Sporting natty bow ties, he was T. Torsvan in Mexico from 1924 into 1950s.

As Ret Marut, mystery man was jailed for deportation from England, 1923.

no more than 26 days of school. . . ."

He said that he had first come to Mexico as a 12-year-old cabin boy, jumping ship from a Dutch freighter. He lived in the country and seldom heard English spoken. "It is therefore only so much more amazing that his books in English can be so impressive, so stirring, so exciting. Now and then you will find paragraphs written in an English as few writers today are able to produce, and reaching the next page you may stand practically petrified on seeing how he mutilates and tortures the English language. But you always comprehend what he means. . . . If Mr. Traven could or would write English without a flaw he would, without doubt, be the greatest novelist come to life within the English speaking world during the last 50 years. . . ." Shy he may have been; modest he was not.

He indulged in punditry, geopoliti-

In late 1940s he surfaced as Hal Croves, purported "translator" for B. Traven.

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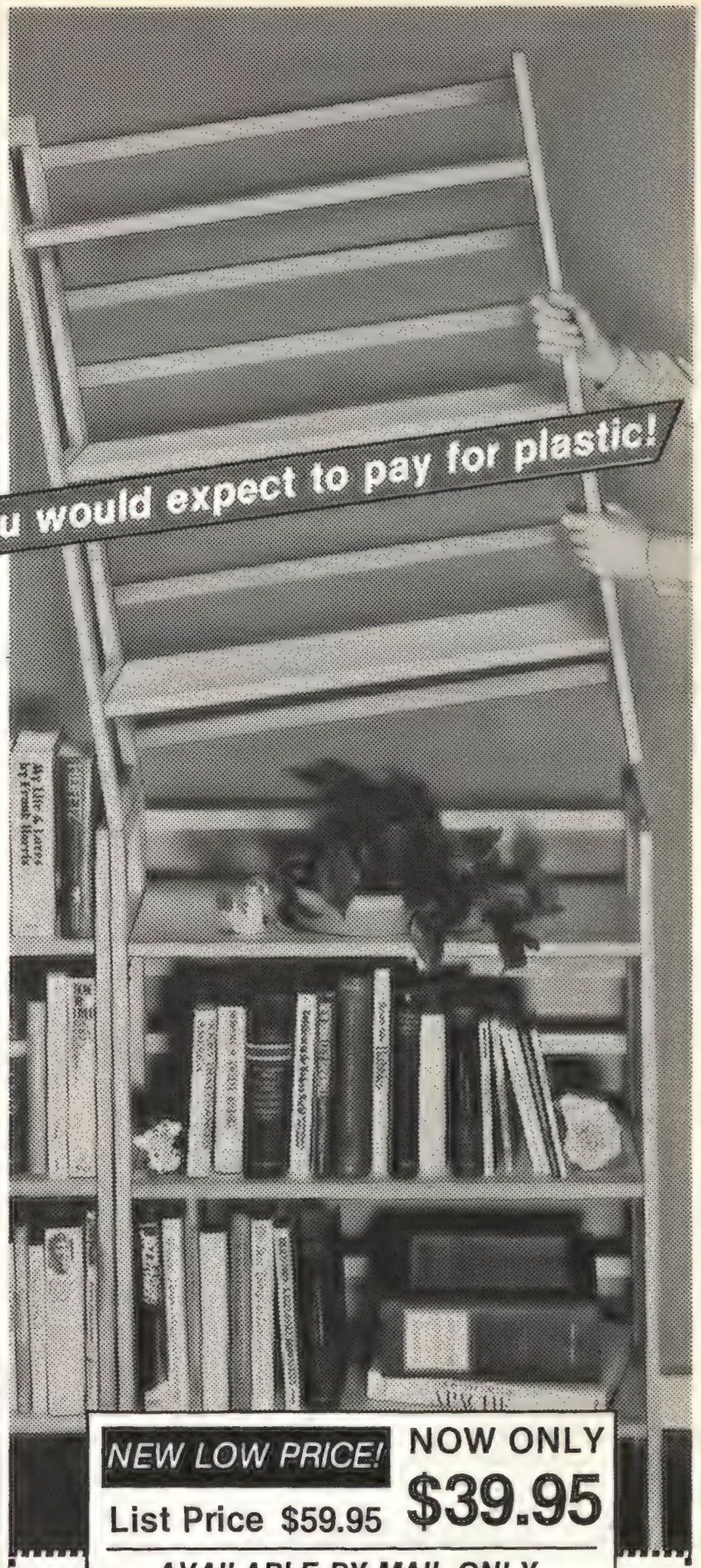

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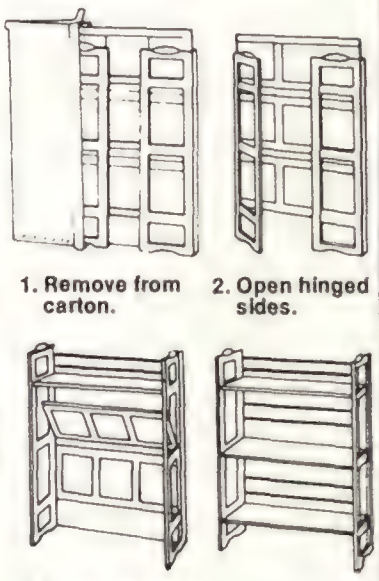

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cal speculation and prognostication. He assumed there would be a World War III. In it two empires would be wiped out and a federation of Western Hemisphere republics would be formed that would dominate the world for the next 500 years.

He predicted that once the ice crusts of the Arctic and Antarctic were pierced, evidence would be found of a civilization that flourished five million years ago.

I wrote my short piece on the Traven myths and soon thereafter was transferred to Argentina, where I put Traven out of mind.

Shortly afterward John Huston, the movie director, hired one Hal Croves, who said he was Traven's agent, as a consultant on the filming of *Treasure of the Sierra Madre*. He was camera shy, reclusive and resentful of the horseplay that occurs on movie sets. Most members of the movie company were certain that Croves was Traven. Huston was skeptical; he thought Traven would be a more forceful character.

Next, a Mexican reporter, Luis Spota, whose enterprise far outweighed his scruples, tracked Croves to Acapulco where, under the name of Torsvan, he was living in a little cashew grove. Through bribery and interception of mail, Spota learned that Torsvan received royalty checks forwarded by Traven's agent in Switzerland. Concerned, Torsvan/Croves heatedly denied that he was Traven.

In the early 1960s an East German researcher, Rolf Recknagel, identified Traven with Ret Marut, an actor and journalist who had been active in the short-lived soviet republic of Bavaria in 1919. After some years with provincial theatrical companies Marut had begun publishing, in Munich, an anarchistic journal called *Der Ziegelbrenner*, or Brick Burner.

Marut played an active role in the brief life of the radical government in Munich and fled from likely execution when troops of the central government crushed it. No one knew where Marut had come from. He had at first claimed to be English; when Germany and England went to war he said he was American. For several years he was a fugitive in Europe, continuing to publish *Ziegelbrenner* irregularly. Then he dropped from sight, and when Traven's novels began appearing in Germany in the mid-1920s old comrades thought they detected Marut's style in this hitherto unknown author. Recknagel's published evidence supporting this theory so upset the author, said his widow, that he became very ill and even temporarily blind.

At about the same time a Swiss critic, Max Schmid, had been puzzling over the timetable of the early Traven books. Marut/Traven had arrived in Mexico in the summer of 1924. By 1925 stories and essays by Traven were appearing in German magazines. Between 1926–29, books with Traven's byline tumbled out like coins from a slot-machine jackpot—five novels, a collection of short stories and a work of nonfiction on the Mexican state of Chiapas.

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Rosa Elena Luján with her husband, Traven/Torsvan/Croves, in the 1960s.

literary work, not quite impossible but certainly remarkable, made even more so by Traven's claim, in correspondence with his publishers, that he could write only what he had experienced. All these books reflected intense experience over an extended period of time. Some displayed a firsthand knowledge of happenings in Mexico at a time when Marut was certifiably in Germany. In three novels and several short stories the first person narrator was Gerard Gales, an American wanderer, adventurer and migrant worker, a rough-hewn and rough-talking character very unlike the literary and intellectual Marut. Schmid speculated that Marut, newly arrived in Mexico, had encountered an adventurous American who had a stack of crudely written but fascinating stories about his adventures. He reasoned that they had agreed on collaboration, that Marut translated and polished the material and sent it to German publishers, that the American, who had obviously had many years in Mexico, gave up his identity papers to Marut, then vanished—and thus the prolific Traven was born.

Here matters stood when I once more became involved in matters Travenian. In 1967, after reviewing a new collection of Traven short stories, I received a letter from one R. E. Luján in Mexico City saying the author was pleased with the review and suggesting the next time I was in Mexico I call a certain number.

This I did. R. E. (for Rosa Elena) Luján turned out to be an attractive lady with gracious manners, descendant of an old and distinguished Mexican family. She invited me to lunch to meet her husband, but gave him no name. At the pleasant and tastefully furnished house in the Colonia Cuauhtemoc I was shown into a snug library. Bookshelves loaded with Traven books in all editions and languages covered the walls.

A slight and frail old man with thick eyeglasses and thin gray hair came slowly down the stairs, called me by my first name and said that I should call him Hal. He held the magazine piece I had written 20 years before. "You see, I appreciated it so much I saved it all these years."

I was flattered, but I later learned that he saved everything—museum tickets, theater stubs, cigar bands, claim checks, bus transfers. He spoke both English and Spanish fluently, but both with what I took to be a German accent. He seemed quite deaf.

We talked about Mexican and U.S. politics, about Indians and Mexican history—particularly the Mexican Revolution, on which I was then do-

Traven's widow preserves his study in their Mexico City home as he left it.

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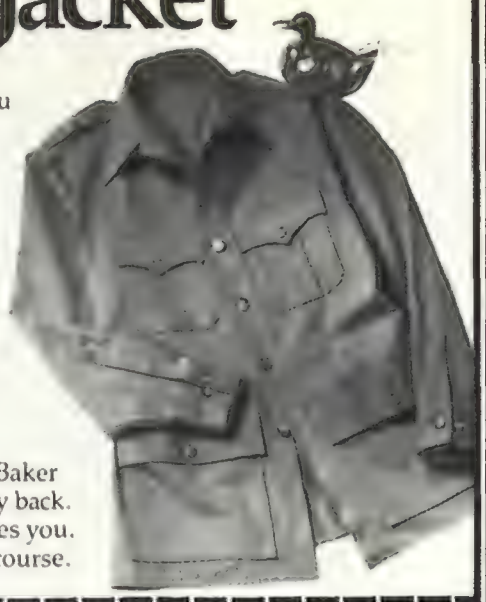

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BBC's Will Wyatt believes Otto Feige (in Swiebodzin c. 1896) was young Traven.

ing a book. He thought Plutarco Elias Calles to be a great revolutionary leader and a great president. I agreed only to the first. We discussed *favorite parts of Traven stories* but we did not talk about Traven. We talked about birds. He had recently stayed up all night trying to nurse a sick bird back to life.

We were both dog lovers, too. He had two, a little white poodle, Gigi, and a mongrel bitch, Tabasco; both were forever at his knee or in his lap. On the patio he showed me dozens of tins in which he had planted seeds from the table—avocados, melons, grapes, plums. On weekends he often took these seedlings to Indian villages on the outskirts of Mexico City to give to the poor. He also carried table scraps on his walks around the city for the ever-present starving dogs. We talked about parts of Mexico we knew and loved and considered making a jeep trip together to some of the scenes of his early adventures.

There were a number of visits. At the ruins in Tepotzotlán I was impressed with his hoard of archaeological and historical knowledge and his

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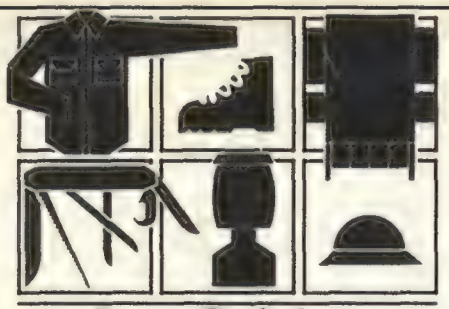

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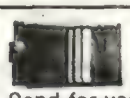

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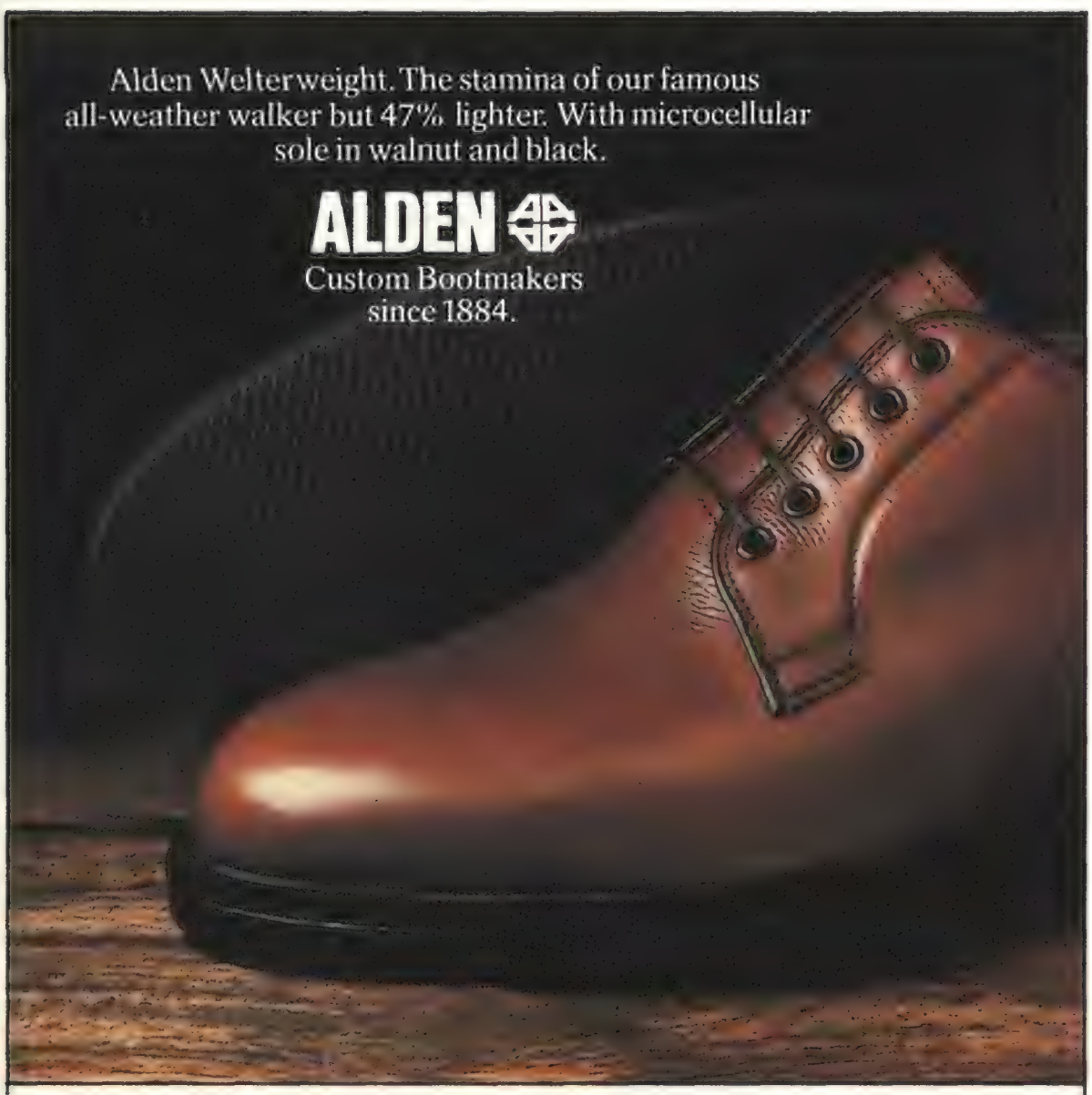
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command of Nahuatl, which he spoke with the Indians there.

That Christmas we received from him a Traven book with a signed inscription. I understood that he almost never put his signature on anything, and we were pleased. But the scrawled signature could have been B. Traven, T. Torsvan, H. Croves or almost anything else.

Then, in the late afternoon of March 26, 1969, the old man died. He left a will stating that the testator, Traven Torsvan Croves, was a native of Chicago, born May 3, 1890, son of Burton Torsvan and Dorothy Croves; became a naturalized citizen of Mexico in 1931; had been married only once, to Rosa Elena Luján; and that he had used pseudonyms such as B. Traven and Hal Croves.

The widow said that while he was dictating his will she had asked him why he did not admit to being Ret Marut as well as Traven and Croves. He conceded that perhaps he should have and laughingly repeated something he had said before: "I think you are more in love with that charlatan Marut than you are with me."

Señora Luján later told reporters

Photographed in Magdeburg c. 1902, Feige, 20, was beginning military service.

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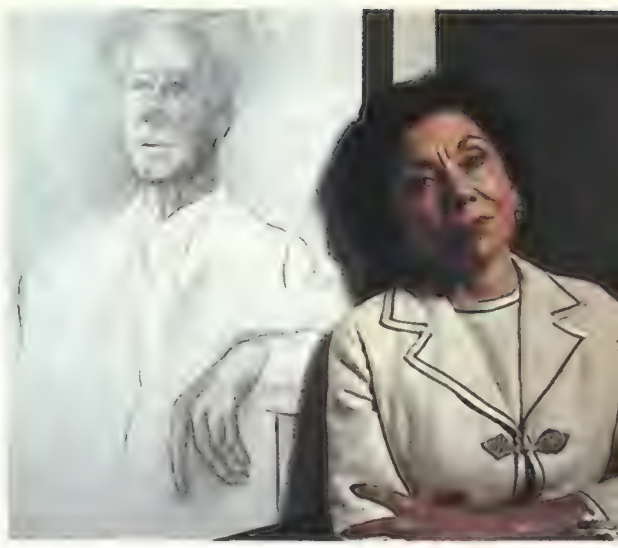

Sra. Luján stands beside Antonieta Figueroa's charcoal sketch of Traven.

that her husband had once been known as Ret Marut.

She asked me if I would be interested in writing Traven's biography with her cooperation. We discussed it for almost a year. She was quite candid in most matters—the considerable number of ladies in his life, for example—but there always seemed to be an invisible sort of barrier in our conversations. Finally, although we remained friends, we gave up. She later told another biographer-nominee (there have been several since) that all I was interested in was facts. And the facts were then, and in many ways still are, rather in disarray.

Then Will Wyatt, a BBC producer, with a lot of hard digging and the formidable research facilities of the BBC, finally followed the crooked Traven trail to Swiebodzin, Poland, a town that once had been German. There, a child named Hermann Albert Otto Maximilian was born in February 1882, to Hormina Wienecke, a mill worker, and Adolf Rudolf Feige, a brick and tile maker. This youngster, who apprenticed to a locksmith, did his military service, was a sort of village radical and became, if Wyatt's deductions are correct, the man of many names—Marut, Traven, Torsvan, Croves and the rest.

Rosa Elena Luján does not accept Wyatt's findings about her husband's humble origins. Although she now

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denies it, she has been quoted as saying her husband was an illegitimate son of Kaiser Wilhelm II. She does say that he came from a cultured background, was fluent in languages, was musical and knew the works of Goethe, Shelley and Shakespeare.

Why the many names?

The threat of a death sentence that forced Ret Marut to become a fugitive and emerge in another country with another identity is a logical enough explanation for one name change. But, if you accept the Will Wyatt theory, he had started changing names before that. Feige has unpleasant connotations in German, suggesting cowardice; Otto Feige's theatrical ambitions may have dictated a more palatable name.

Mexico, the country to which he came as a fugitive, was at the time of his arrival in considerable confusion, undergoing the aftershocks of revolution. A man without documents, as Marut appears to have been, could declare himself to be anyone he liked.

At Traven's memorial service in Chiapas I ran into a former Mexico City journalist, unkempt and worse for wear, who said he had done press agentry for the publishing house that brought out *Una Canasta*. To stimulate sales he had planted the story that a U.S. magazine had offered a big reward for the unmasking of B. Traven. This was what got me involved in the chase originally. He said he did not know if Traven had given his consent for this gimmickry. If he had, it suggested that Traven was not so much a mystery man as he was a mystery maker—all in the interest of selling books.

But the man I finally had met seemed utterly indifferent to money.

His widow thinks the many names and the elusiveness came from her husband's playfulness. She said he would often tell people outrageous and impossible things and watch closely for their reactions.

Somehow it was more earnest than that. There is a passage in *Death Ship* that may explain it. The narrator, Gales, and Stanislav the Pole are shipmates on the *Yorikke*, an ancient vessel that is doomed to be sunk for insurance. Only men without passports, without home, without nationality, will work on such a ship. One night the two men traded life stories.

Said Gales: "The story . . . was not my true story; it was just a good story. . . . How can anybody know if any story told or heard is true?"

A good story. What else can one ask of a storyteller?

Author's death mask is centered among books he either wrote or treasured.

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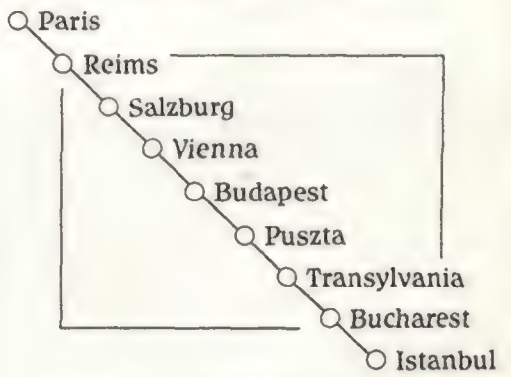

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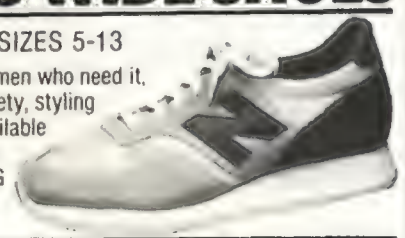

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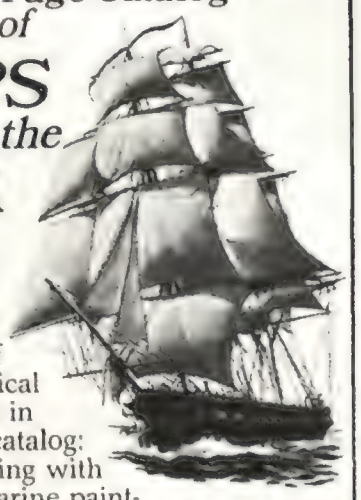

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Book reviews

A Diplomat's Wife in Japan
Mary Crawford Fraser
Edited by Hugh Cortazzi
John Weatherhill, $29.95

Letters from Sachiko; A Japanese Woman's View of Life in the Land of the Economic Miracle
James Trager
Atheneum, $12.95

It is an intriguing idea that two powerfully feminine voices, one from an age and class that might only just imagine the evolution of the other, could illuminate a century's worth of cultural change. Such is the combined effect of Lady Mary Fraser's *A Diplomat's Wife in Japan*, first published in 1899, and the decidedly contemporary *Letters from Sachiko*.

Where Lady Fraser finds Toyko's cherry blossoms infinitely more thrilling than an impending Royal visit to the British legation headed by her husband, Sachiko tells of the tremendous crowds one must brave in order to view them today. Not long before Lady Fraser's time, Japan was, as she puts it, "just emerging from its political swaddling clothes"; in Sachiko's, Japan's rising share of world trade makes for an increasingly competitive, heterogeneous society in which one must persevere in order to be transported by the flights of poetry that so regularly reached Lady Fraser's receptive soul.

A sophisticated yet openhearted woman who spent much of her own childhood in Rome's artistic and literary circles, Lady Fraser was clearly enchanted by Japanese children, whose upbringing appeared to be far more tender than that of Europeans. "The love showered upon

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children simply wraps them in warmth and peace, and seems to encourage every sweet good trait of character without ever fostering a bad one," she wrote.

Sachiko's young son, on the other hand, is already facing academic pressure to excel in order to secure a position with the large companies that control Japan's economy, a phenomenon that has been widely linked to the country's high teenage suicide rate.

Sachiko, who is actually a composite of author James Trager's Japanese sisters-in-law, writes, "So many young *ronin* are memorizing English words and mathematical formulas and so forth, which they will forget as soon as the exams are over, that I wonder whether our educational system makes any sense." The *ronin* were masterless fragments of a samurai class abolished shortly before the Frasers were in residence. Now, the term refers to young people who, having failed to get into the universiy of their choice, have enrolled in cram schools and are studying furiously for the next round of examinations.

Lady Fraser allows that "on some points, my knowledge is wider and more accurate" than that of Japanese women, "yet there are many others where I am glad to learn from them." American women might easily formulate similar feelings for Sachiko, who begins to write her letters as an apartment-bound wife channeling much of her growing restlessness into chronicling Japanese social change for the benefit of her curious sister in New York City.

In the Frasers' day, there were ample grounds for the old Japanese saying, "marriage is a woman's grave," what with the obeisance that had to be paid to husbands, who could divorce their wives for any number of less than compelling reasons; and mothers-in-law, who treated their eldest sons' wives as servants. Trager calls upon the Japanese penchant for statistics to show that even now, most Japanese husbands would get in touch with their businesses before their wives in the event of an earthquake.

Sachiko herself may sound a little naive to Americans, since she only recently discovered the venerable revelations of Betty Friedan's *The Feminine Mystique*. And in this country where Mary Kay ladies ride around in pink Cadillacs, the liberation that Sachiko

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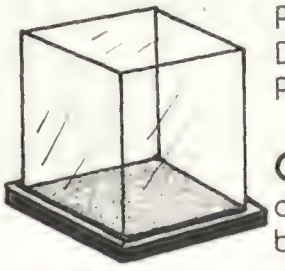

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finds as a successful distributor of cosmetics sold in the homes of other housewives seems an exceedingly mild form of departure. Still, Sachiko is acutely aware of the obstacles faced by other Japanese career women and wonders if equal rights can ever be obtained by men's rules alone.

For quite different purposes—those of enchantment—Lady Fraser's book is the more satisfying. "It always seems to me that, if I see things at all," she writes at one point in her Japanese travels, "I have the good fortune to see them in the most charming way." Under the spell of a Japanese fairy tale, she impulsively buys out the entire stock of a street vendor selling fireflies in tiny horsehair cages. Then, knowing that the Japanese have named these creatures for a moon sprite called Princess Splendour, she climbs out on her own moonlit balcony and releases them all at once. "I felt like a white witch who had called the stars down to play with her."

No doubt many travel to Japan seeking the magic Lady Fraser found there and return with at least a leavening of the more pragmatic vision of Sachiko. Together, though, they span the distance between Japan's spiritual and economic miracles.

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In Suspect Terrain
John McPhee
Farrar, Straus & Giroux, $12.95

Interfluve. Microplate. Cactolith. If you have long been confused, or were long ago put off, by the arcane argot of geology, take heart. Geology is named for Gaea, who appeared after Chaos, as John McPhee learned in researching *In Suspect Terrain* and its predecessor, *Basin & Range*. McPhee has learned much more about the making and remaking of this land, and because he is as gifted a teacher as he is a pupil, we stand to learn much in these pages.

He is a master at sharing his enthusiasm for the unfamiliar, having done so in 15 books concerning such diverse fascinations as fruit growing, boat building, Alaska and gourmet cooking. His *Basin & Range* began with a cross-country journey, in the company of professional geologists, and the avowed aim "to choose some things that interested me and through them to suggest the general history of the continent."

Across thousands of miles of western interstate, through layers of "verbal deposits" of geological terminology, epochs of prehistory, and centuries of geological theory, McPhee did just as promised, bringing readers to the Earth-shattering geological shift of the past 20 years—the emergence of the theory of plate tectonics. That theory, explaining the Earth's appearance by the shifting and colliding of vast segments of crust, has swiftly become geological gospel.

But a substantial number of geologists, including Dr. Anita Harris, "a geologist who does not accept all that is written" on plate tectonics, believe this theory is often a "lazy man's out." In the company of this independent-minded woman, McPhee continues his travels on I-80 in his home country of New Jersey and Pennsylvania, examining familiar ground that has become, through the geological perspective, "suspect terrain." No theory—not tectonics, not glaciation—can fully account for the hows and whys of this terrain, but McPhee has a go at the "when."

It is not an easy perspective to communicate, when a century's events may leave only a one-tenth-inch deposit in the neighborhood rock, but McPhee brings the immense and insidious forces of geology within our ken. He does so by direct

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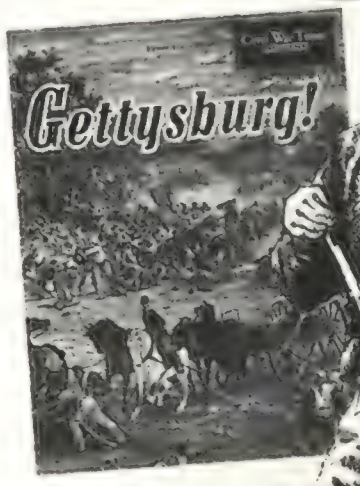

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comparison, matching the changes that have befallen resort communities at the Delaware Water Gap with the geological formation of the area, with its "upward-fining sequences, its laminations of events, its slow deteriorations and instant catastrophes."

Such analogies do much to clarify the science. So, too, do McPhee's many factual excursions into the formation and detection of oil and diamonds, the geological insights of the Minsi Indians, even the petroleum interests of one John Wilkes Booth.

To open a seam of understanding in our perception of the science, McPhee also involves us in Dr. Harris' own richly layered professional life. From a Jewish Brooklyn girl, "who didn't know from geology," emerged an accomplished scientist with catastrophist philosophical leanings, confirmed by experiencing a violent earthquake near West Yellowstone, and informed by a true detective's mind.

Much that is blurred or obscured in the public's view of geology and geologists can be clarified by reading *In Suspect Terrain*. Readers of *Basin & Range* will find that its successor plumbs deeper and ranges farther. Readers, old and new, of McPhee will be entranced by the crystalline elegance of his prose. *In Suspect Terrain* will not answer all of your questions about geology, or its practitioners, but neither McPhee nor geologists would wish to suggest that such fundamental questions as "What makes the mountains come up in the first place?" are yet understood. That is part of the wonder of geology, and of *In Suspect Terrain*.

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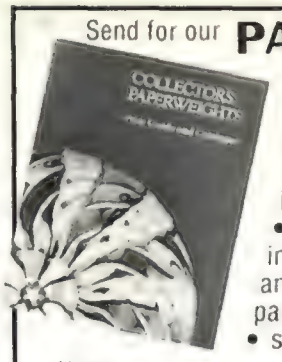

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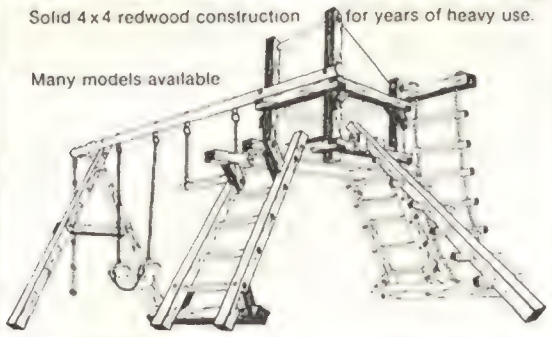
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works, presented in alternating sections. One is a review of scientific literature on feral cats—that is, lost, strayed or abandoned domestic cats that have gone wild. The other book is a collection of anecdotes about the feral cats that the author and her husband have encountered around their home in the hills of Vermont.

The research covered is monumental. The bibliography includes some 150 works, not including the author's own interviews with various wildlife biologists, veterinarians and other scientists. The first surprise to readers who know house cats is that there are so many wild survivors to study so extensively.

The literature in great part concerns feral cats in the countryside or in areas remote from much human habitation. Some work has also been done on strays in the city, those feral cats that are trying to make a living in our back streets and abandoned buildings. Cats in the wild have been studied from Australia to California to Marion Island, near South Africa. Part of this investigation has concerned the impact of feral cats on particular ecosystems or on human health.

Many studies are fragmented, out of date or biased, the author notes, saying that there exists no comprehensive, recent, accessible discussion of these animals. She has done an admirable job of pulling what there is together for us.

We learn, for example, that feral cats are territorial, living out their lives in well-defined areas. Mortality among kittens is high (not surprising, since kittens born even in optimal conditions tend to be fragile). Feral cats are virtual omnivores; bird lovers will be glad to hear that they do not have a significant impact on bird populations, except possibly in a few areas with large numbers of ground-nesting birds.

It is disappointing, however, that in her highly interesting investigation of the feral cat as predator, Mrs. Berkeley does not examine the matter of predation against feral cats themselves. Surely in rural Vermont much could be learned about the impact on feral cats of hunters, trappers and free-running dogs.

The health danger of feral cats to human beings remains, as she points out, vague. The cat apparently has been given a bum rap. The transmission of rabies, for example, from American cats to hu-

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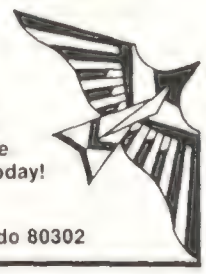
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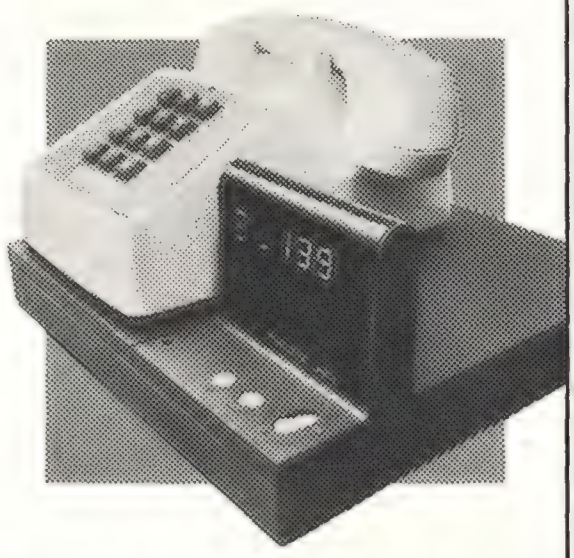

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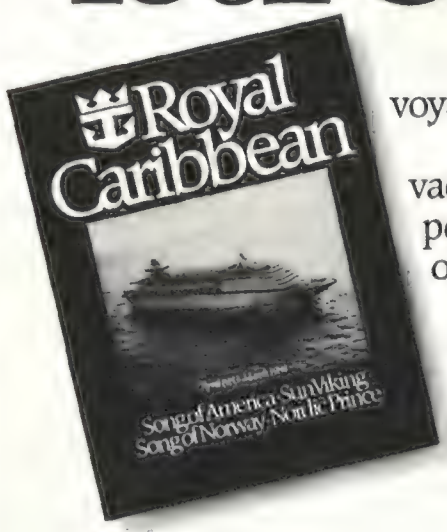

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man beings is so rare as to be almost nonexistent. Feral cats do transmit feline diseases to one another.

By her own admission, however, the author had little personal knowledge of cats. None of what she learns in reading and interviewing is filtered through a long and close familiarity with cats. Experienced cat owners will find some of the studies quoted extremely dubious.

Mrs. Berkeley does credit Paul Leyhausen with being a foremost authority on cats, and quotes him extensively. But she also gives serious attention to the thesis of the novel *Feral*, by Berton Roueché. This fiction, riding the wave of the recent public taste for horror, depicts a terrifying mob of rampaging, man-killing feral cats. Could this really happen? she asks innocently, and puts the question to various scholars—which is akin to asking the Audubon Society if Hitchcock's movie *The Birds* could be true, or asking a society of primatologists about the realistic possibilities of *King Kong*.

Most of the personal stories the author relates about "her" feral cats are charming. But some are depressing. She befriends and feeds a cat she names Sylvester, for example; even takes him to the veterinarian for treatment of a health problem. But when Sylvester begins to pester her favorite, Turtle, a female, he is driven some distance away and dumped.

Another section describing her encounter with a cat she discovers dying in her driveway is in such questionable taste that one wonders about the judgment of the author—and her editor—for including it. The back of the hand to a fine writer for this appalling episode in the book.

Patricia Curtis
Writer on animals and author
of *The Indoor Cat*

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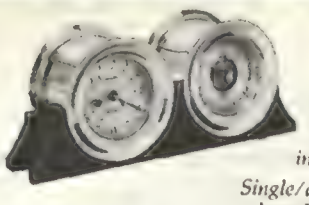

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The Romans, in the words of the poet Virgil, regarded the spot as the mystical end of the earth, *ultima Thule*. More romantically inclined thinkers imagined a mythic race of noble primitives who lived there and named them Hyperboreans, a civilization for us all to aspire to. As this book ironically suggests, such were not entirely wrong.

In the summer of 1950, author Jean Malaurie, a French geomorphologist, went to live among these people and study their land. But he found that there is more to a land than climate and terrain, and that humans can survive such inhospitable conditions only through a rare combination of grit, personal dignity and cunning resourcefulness. Malaurie's journal, a revision of the 1956 edition, documents those traits along with his slowly dawning appreciation of their folkways, life-style and methods of survival.

Polar Eskimos lived in igloos fashioned of peat and stone, meagerly heated by seal and walrus fats burned in crude soapstone trays. Wood was unknown until the 19th century; metals were available only because of a fortunate fall of meteorites at the village of Savigssivik, and of flint found in several small quarries. Because the region gets only about four inches of precipitation a year, these people seldom build *illuliaqs*, the temporary snow

Kaalipaluk of Thule is thought by Polar Eskimos to be the son of Robert Peary.

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houses used by wandering hunters. Nor do they use snowshoes.

Every page is filled with fascinating anecdote. Here, for example, is a description of *kiviaq*, a staple made of birds, and a favorite meal among the Polar Eskimos: "My neighbors watched as I applied myself to the job of eating. I pulled on a leg, and the carcass slipped free of skin and feathers. The bird was well rotted indeed. Flesh, heart, coagulated blood, and fat virtually ran into my hand."

Malaurie learned the Eskimo's difficult language and managed to decipher how hunters learned to read the book of natural phenomena: the migration of birds, the brightness or dimness of stars, the moon's halos, cloud formations, why foxes and rabbits change their ordinary routes, how the tundra melts, and how the shoreline changes from year to year.

Over the three decades since his first visit to the Polar Eskimos, Malaurie has returned several times to note the effect of change on them. Today, these people are vastly different from the way they once were. The total Eskimo population rests now at about 100,000 worldwide, settled into a wide range of life-styles and environment. (For a view of Bering Strait life, see SMITHSONIAN, May 1982.)

Although this book is about the relative handful of Polar Eskimos, Malaurie has been a tireless worker on behalf of them all. As director of the French Center for Arctic Studies, he is now struggling to ensure that our rush to exploit northern oil does not sweep away this important outpost of civilization.

Michael Olmert
Writer and critic

Freud and Man's Soul
Bruno Bettelheim
Alfred A. Knopf, $11.95

In his latest book Bruno Bettelheim argues persuasively that Freud's reservations about American culture turned out to be justified. Freud was, in fact, rather prejudiced against this country: he saw us to be materialist philistines. Moreover, his sons fought during the First World War in the Austro-Hungarian army, and so we were literally their enemy.

Well before that war—perhaps shrewdly calculating our future social and cultural importance in the West—Freud had sailed across the Atlantic to deliver a series of lectures at Clark University in Worcester,

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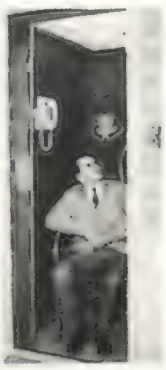

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Massachusetts. There he was enthusiastically received by influential members of the psychoanalytic community, including the incoming president of the American Psychoanalytic Society.

By the time Freud died in 1939, the United States was on its way to becoming the center of the international psychoanalytic movement. Refugee analysts had come during the 1930s to such cities as New York, Philadelphia, Boston, Los Angeles and San Francisco. Once here, many of them did what others before—the poor and uneducated as well as comfortable professional people—had always done: they tried to be thoroughly integrated into a particular community.

In seeking such acceptance, psychoanalysts unequivocally embraced American science and medicine. This included its language: technical, abstract, impersonal, the so-called "value-free" words of the laboratory. By the 1950s American psychoanalysis had become a subspecialty of psychiatry, a branch of medicine, despite Freud's plea in *The Question of Lay Analysis* that men and women from all sorts of intellectual disciplines be trained for the kind of study and reflection he had offered the world in the early years of the 20th century.

The advantages of the new professional bias were obvious. To be blunt, it meant taking on the power and glory of science and medicine that obtains in a country like ours, not to mention the concomitant financial success. But there were costs, too, and it is this side of things that Bettelheim wants us to ponder.

Psychoanalysis, he reminds us, was used by Freud first to learn his own inner secrets—and then to share them unashamedly with others. Later, it became a means by which other human beings came to know themselves and, with this self-knowledge, to know one another—in a sense, their fellow men and women everywhere.

Put differently, psychoanalysis belongs to a long intellectual and moral tradition in the West—from Socratic and Augustinian self-scrutiny to the probings of mind and heart rendered in the name of Existentialism by such philosophers as Kierkegaard, Gabriel Marcel, Heidegger and Martin Buber, or in a literary vein by Dostoevsky, Melville, Faulkner and Walker Percy. But philosophers and novelists like these are rarely congenial to the

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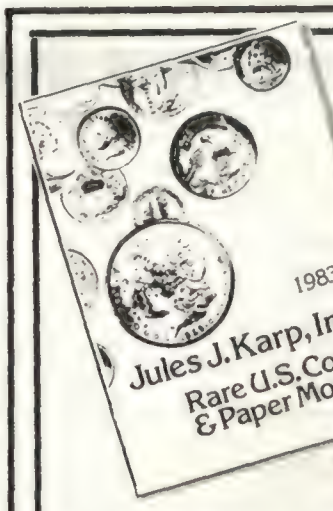

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Leaders of psychoanalytic profession gather in Worcester, Massachusetts, 1909. Seated, left to right, are Freud, Clark University president Hall, and C. G. Jung.

thought of us American psychiatrists and psychoanalysts, who are always at pains to parade our objectivity, our cool and aloof posture, our rigorous detachment.

Since all of us announce ourselves through the language we use, it is no accident, Bettelheim maintains, that Freud's eloquent yet direct and earthy and often touchingly anecdotal mode of expression—that of the literate, humane essayist—has become something else in translation from German to English. It has been turned into a jargon meant to evoke the authority of a secular religion of sorts: applied science.

So it is that words like "parapraxis" and "cathexis" have come upon us—and, yes, Id and Ego. Where Freud talked about "the soul's activity" we talk about "mental processes." Where Freud called upon Greek tragedians and Latin legends, we call upon a ponderous, technical vocabulary which uses the prefixes of those languages, their stem words, in the service of dense, even muddled conceptual generalizations. Moreover, theory becomes something else, not only overwrought words, but an ideology that demands acquiescence, if not thoroughgoing compliance. We journey from "the soul" to "the mind," from the spirit to the letter; and the result is a scandal, really—what psychoanalyst Erik Erikson once called, referring to the same phenomenon Bettelheim describes, "punitive orthodoxy."

Language is always crucial in such developments, as Orwell reminded us in *1984*. The essence of Bettelheim's book is just that—a poignant and elegant reminder that in psychoanalysis, no less than in politics, words can lose their way, can become devilish instruments of our isolation one from another. Our human involvements turn cold—in a phrase of Emily Dickinson's, "zero at the bone." Bettelheim's book offers, by way of contrast, a penetrating warmth, but one suspects he has no great hope that a given climate will soon be reversed.

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Additional reading

Ground water (p. 50)

Groundwater by R. Allan Freeze and John A. Cherry, Prentice-Hall, 1979

Hydrogeology by Stanley N. Davis and Roger J. M. DeWiest, John Wiley, 1966

Water Well Journal, a monthly publication of the National Water Well Association, 500 W. Wilson Bridge Road, Suite 135, Worthington, Ohio 43085

Proceedings of the Second National Symposium on Aquifer Restoration and Ground Water Monitoring (May 26-28, 1982), available from the National Water Well Association, $35

Russian restoration (p. 64)

"Saint Basil's and other curiosities" by William C. Brumfield, *Harvard Magazine*, July-August 1982

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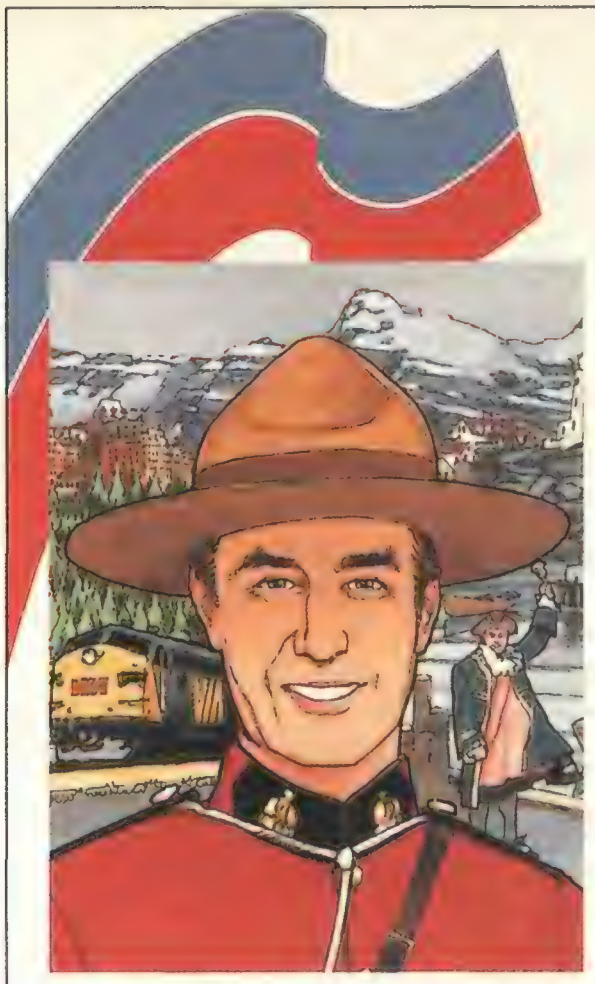
Sir Joseph Banks: 18th Century Explorer, Botanist and Entrepreneur by Charles Lyte, David & Charles (London), 1980

"The Banksian Natural History Collections of the *Endeavour* Voyage and Their Relevance to Modern Taxonomy" by H. B. Carter et al., *History in the Service of Systematics*, Society for the Bibliography of Natural History (London), 1981



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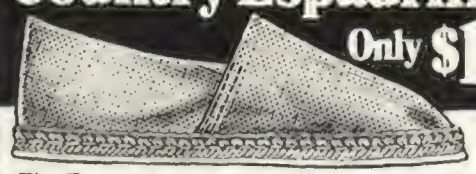

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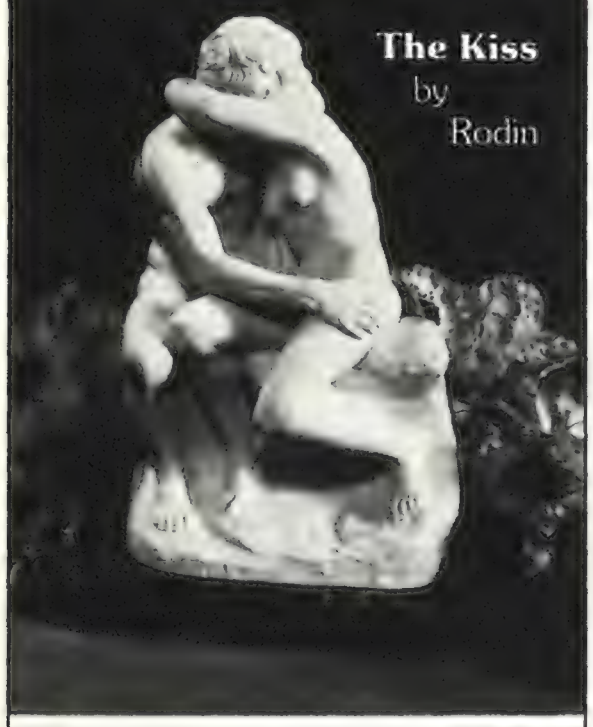

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Sled-dog racing (p. 88)

The World of Sled Dogs; From Siberia to Sport Racing by Lorna Coppinger with the International Sled Dog Racing Association, Howell Book House (New York), 1977

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Atlas of the History of Spectacles by W. Poulet, translated by Frederick C. Blodi, Wayenborgh (Bonn), 1978

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Animal Biochromes and Structural Colors by D. L. Fox, Cambridge University Press, 1953

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Ruxton of the Rockies by Clyde and Mae Reed Porter and LeRoy R. Hafen, University of Oklahoma Press, 1950

The Mountain Men and the Fur Trade of the Far West (ten vols.), edited by LeRoy R. Hafen, Arthur H. Clark (Glendale, California), 1965-72

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The Secret of the Sierra Madre: The Man Who Was B. Traven by Will Wyatt, Doubleday, 1980

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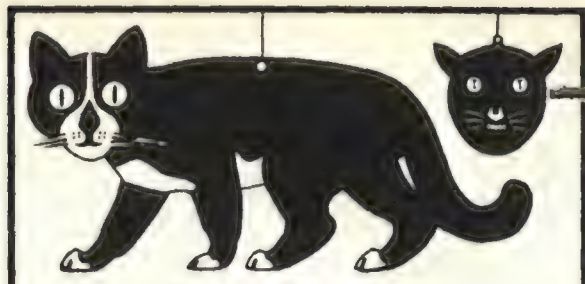

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Smithsonian highlights

A visit to the Mall this month will provide a good idea of the latest developments in American art and Japanese ceramics. At the Hirshhorn Museum and Sculpture Garden, the third biennial *Directions* exhibition (opening March 10) presents curator Phyllis Rosenzweig's judgments of where American art is now —and where it's going. Among the 40 works are constructed environments, photographs, drawings and sculptures. Continuing at the National Museum of Natural History is *Japanese Ceramics Today: Masterworks from the Kikuchi Collection,* the largest and most important show on this subject ever to come to the United States.

Special March exhibits and events

National Museum of American Art
Jose de Creeft: Sculpture and Drawings (March 18-May 8) Retrospective exhibit.
Familiar but Unique: the Monoprints of Joseph Goldyne (March 6-April 24) NMAA circulating exhibition, at Madison Art Center, Madison, Wisconsin.

National Museum of Natural History
Francis Lee Jaques: Artist/Naturalist (March 12-April 24) Show documents life and work of American wildlife artist.
Japanese Ceramics Today: Masterworks from the Kikuchi Collection (through April 3).

Hirshhorn Museum & Sculpture Garden
Directions 1983 (March 10-May 15) Third biennial show provides showcase for new works of 17 artists.

Cooper-Hewitt Museum (New York)
Designs for Theater (January 25-May 1) Drawings and prints depict the rich world of the stage.

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The Eight (through June 26) Works by early 20th-century group led by Robert Henri.

National Air and Space Museum

Poetry and the Stars (March 5; 9 A.M.) Monthly sky lecture.

Airshow Flying (March 10; 7:30 P.M.) Flyer Bob Hoover, veteran of 2,500 airshows, talks about his trade.

Wildcat Ace (March 31; 7:30 P.M.) Joe Foss recounts his air victories over Guadalcanal.

Smithsonian events

For price information and tickets to Resident Associate events, call 357-3030:

New Australian Cinema (five Tuesday evenings beginning February 22; 7:30 P.M.) Series features ten New Wave films.

Rediscovered Empire: New Archaeological Findings from Ebla (March 19) All-day seminar on cuneiform tablets, led by archaeologist who discovered them.

Northern Lights: Scandinavian Art, Music and Literature (six Thursday evenings beginning March 31; 8 P.M.) In-depth lectures, visits, mini-concerts.

Origins of Life: Studies of Chemical Evolution (March 31; 8 P.M.) Slide lecture by Dr. Cyril Ponnamperuma.

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Jelly Roll Morton, featuring rare recordings from the Smithsonian Collection; *Directions 1983*, the Hirshhorn Museum exhibition that presents the work of new artists; and a Woodrow Wilson Center program on the Cold War today are among the March listings for Radio Smithsonian. To find out which stations in your area carry these programs, write: Smithsonian Office of Telecommunications, MNH Room C222B, Washington, D.C. 20560.

Musical Weekend in May

A Metropolitan Opera performance of *Der Rosenkavalier* at the Kennedy Center is featured on the Eleventh Musical Weekend, April 29-May 1. During the weekend the Division of Musical Instruments and the Friends of Music provide all meals, hotel accommodations for two nights, and tickets to musical activities. For details, write: Musical Weekend, Room 4124, NMAH, Smithsonian, Washington, D.C. 20560.

Smithsonian Institution Traveling Exhibition Service

SITES circulates exhibits to hundreds of cities outside Washington. To sponsor a show in your community, write: SITES, Smithsonian, Washington, D.C. 20560. Here are some March exhibits:
Little Rock (March 26-April 24) *John Sloan in Santa Fe*, Arkansas Art Center.
Miami, Florida (March 12-April 10) *Beauties of the Coral Reef*, International Oceanographic Center.
El Dorado, Kansas (March 26-April 30) *America's Space Truck: The Space Shuttle*, Butler County Community College.
St. Louis (March 19-April 17) *Images of Old Age in America*, Vaughn Cultural Center.

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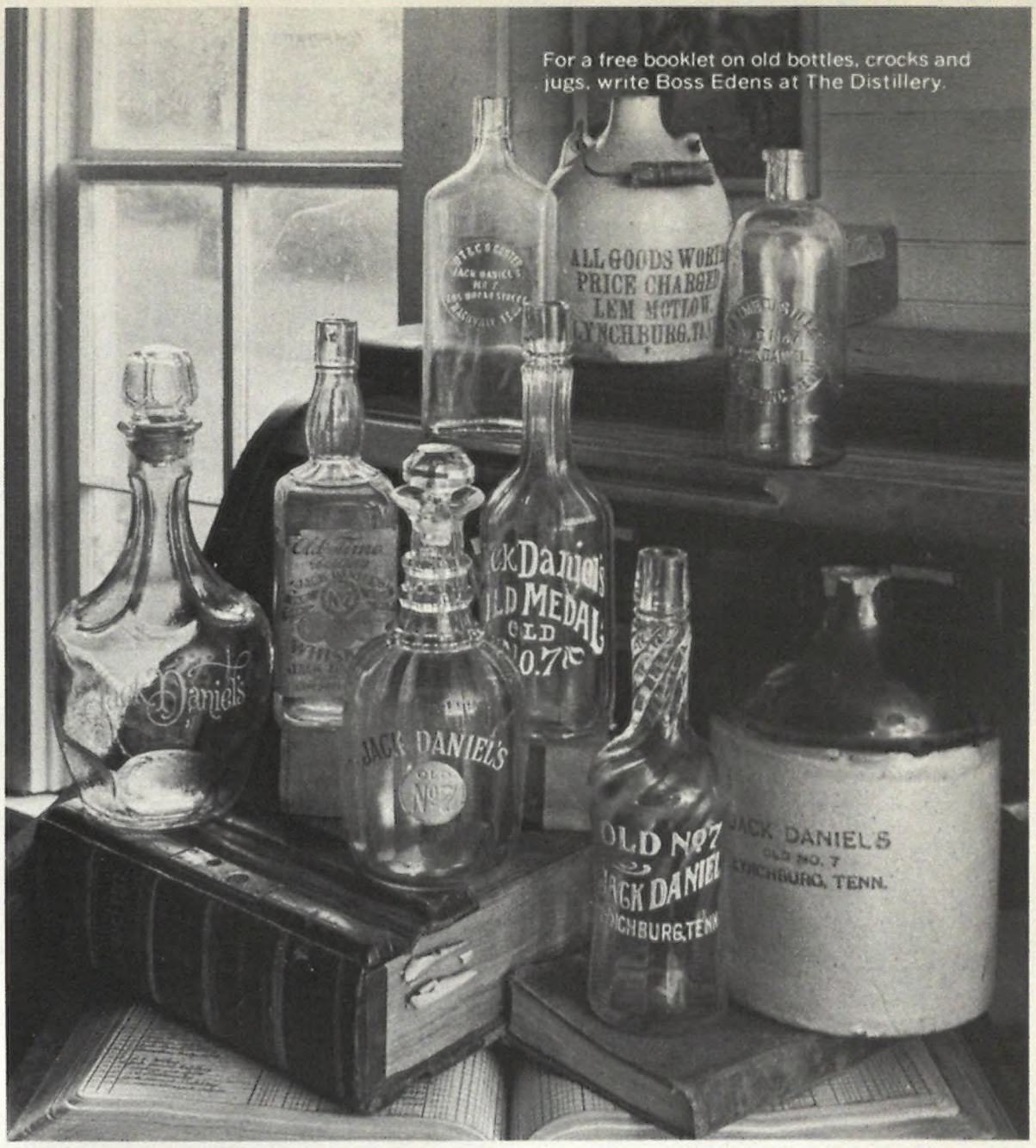

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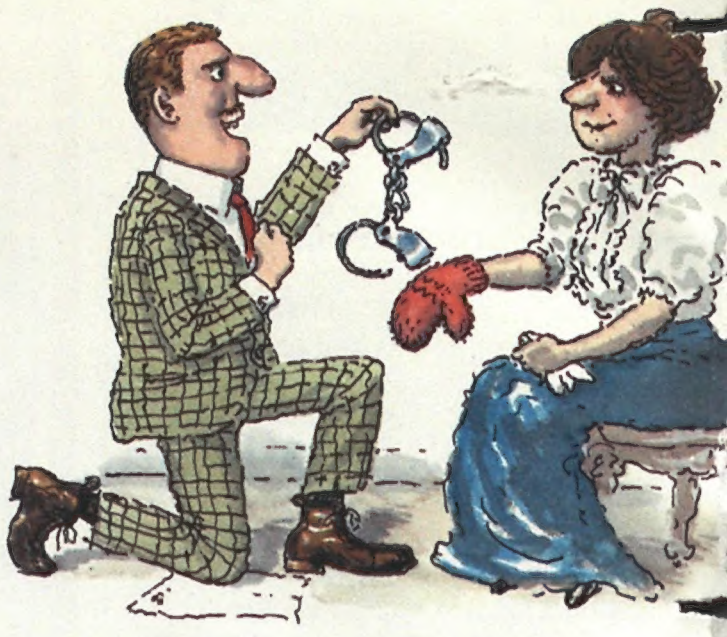
By Richard Wolkomir

Slipping the mitten to a catawamptious wally: the slang gap revisited



Omigod, I'm an airhead. I mean, like this 15-year-old named Moon Unit Zappa did this awesome hit record, "Valley Girl," about all these teens who are into designer clothes (like *totally*!) and this absolutely *tubular* lingo, "Val-Speak"? And I only find out about it from the yucky *New York Times*, like *weeks* after it's peaked, you know?

Grody to the max! I mean, am I beige? Fer sure!

The translation—for all who, like me, are invariably at least six months behind the current sensation—is "Grotesque to the maximum! Am I boring? Definitely!"

When I was a teen, back in the Fabulous Fifties, we said things like, "See you later, Alligator," and we felt smug because our parents and teachers never said "See you later, Alligator." They said "Twenty-three skiddoo." Or "Yes, we have no bananas." Old stuff. But now "See you later, Alligator" sounds archaic enough to have been chiseled on a temple wall at Karnak. Presumably, though, ancient Egypt's young hotshots said things like "In the Nile, Crocodile."

"Slang," Carl Sandburg says somewhere, "is language which takes off its coat, spits on its hands,—and goes to work." Well, fer sure. But slang also is a nifty way to sound sharp, in the swim, hip. Treacherous, though, like all fashion. One day you discover that "In the Nile, Crocodile" is out. Most slang words, like mayflies, flutter in the sun for just a day and then vanish. Nobody seems as dated, or pretentious, as a slangster two weeks off pace.

However, slang is the language's id, often crazy, yet full of creative pizzazz. Somewhat owlishly a scholar calls slang "the source from which the decaying energies of speech are constantly refreshed." Walt Whitman, an up-front slangophile, put it this way: "Many of the slang words are our best; slang words among fighting men, gamblers, thieves, are powerful words." Right on, Walt. But here in the Edgy Eighties, though there is no shortage of thieves or gamblers, we may be facing a linguistic crisis: Are we running out of slang?

Junk food is generated in abundance. Yet when it comes to junk language—Mc-Words?—we don't seem to be cooking with gas. To be sure, there is Val-Speak, a winsome hatch of verbal butterflies. But it is an ecological isolate, flourishing only among one sex of a certain age in a particular, rarefied habitat.

Otherwise, today's pickings, slangwise, are slim. A lot of it is simply technical jargon. We want "input" and we expect "feedback," so we can get on someone's "wavelength." And we all know weirdos who are "in orbit," real "space shots." Politicians, while keeping a "low profile," have popularized the need to "stonewall." And any 13-year-old can explain that the "dork," yesterday's jerk, has become today's "wimp." And that is just about all she wrote.

For a real sense of how slang-poor we are, consider our ancestors' rich lode of argot. Let us, for instance, absquatulate (decamp) to the early 1900s, where we meet a Lard King (Cincinnati millionaire) and a Know-Nothing (ignoramus), who would like to be a big bug himself. But this chap must "gaze at the melody" (face the music); he'll be lucky to find work as a pearl diver (dishwasher).

For one thing, he is carachtevankterous (excessively impulsive). This pumble chook's (fool's) aspiration to be a money bug would make a stuffed bird laugh! You can bet our catawamptious (eager) friend will blow any toadskins (paper bills) he gets on corpse-reviver (strong drink). And then, completely pifflicated, he's sure to want a hot date with a sweetums.

But this scallywampus (good-for-nothing) is just a wally (small-town sport). And if he offers his chicken a handcuff (engagement ring), she is sure to give him the mitten. And what can we modern dudes say to that?

One great source of slang, in more decorous times, was euphemism, and the sense that it was daring to refer to faintly improper topics in other terms. In the Anything-Goes Eighties we can pitch a few drug-culture zingers, but any turn-of-the-century scallywag can blow us out of the ballpark just with his arsenal of alternate words for strong drink—blue-blazer, damp bourbon poultice, death promoter, oil of joy, pizen, rattle-belly pop, red eye, third rail, and torchlight procession.

Food? Nowadays everybody knows "The Big Enchilada." But citizens of the young century *really* liked to play with their verbal vittles. Beef stew was "bossy in a bowl." And why call an egg an egg if it can be a cackleberry? Why call a dollar a buck if you can call it mazuma or boffo or a simoleon? In short, why not have some fun?

Sure, there was that 1902 scholar who complained that slang's origins are "low, or at least, undignified, and perhaps disgusting." In any event, our friend the Valley Girl has an answer to that: "Gag me with a spoon!"

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